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ABSTRACT

This instructional guide is designed to teach vocational and technical instructors how to modify existing programs and develop new programs to apply computer graphics to selected vocational and technical programs. Addressed in the individual units of the guide are the following topics: vocational program modification (course modification for vocational programs, instructional material, time sharing, modification for handicapped and limited English-proficient (LEP) students); introduction to computer graphics (computer acceptance groups, degrees of cyberphobia, myths about computers, use of computers in classrooms and laboratories, course material profiles, selection of projects and project objectives, discussion of project objectives, and computer terms and definitions); program design (computer users, methods of learning, specific objectives and how to define them, a design guide, and project formats); graphics (guidelines, drawing graphics, and graphics and commands); text (kinds of text and avoidance of poor text); student-instructor interaction (kinds of questions and avoidance of poor questions); student input and computer interactions (kinds of input, avoidance of poor input, and feedback) and project evaluation. Each unit contains some or all of the following: objectives, series of information sheets, suggested learning activities, and transparency masters. (MN)

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"EXEMPLARY/INNOVATIVE - AN APPLICATION OF COMPUTER GRAPHICS CURRICULUM TO SELECTED VOCATIONAL/TECHNICAL PROGRAMS"

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TEXAS STATE TECHNICAL INSTITUTE
SWEETWATER, TEXAS

1984

COMPUTER GRAPHICS

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VOCATIONAL PROGRAM MODIFICATION

UNIT I

OBJECTIVES

After completing this unit the participant should be able to discuss methods for modifying vocational program for sources of instructional material and for time sharing. The participant should also be able to discuss methods for program modification for handicapped and LEP students and methods to provide for equal access to all trade areas.

SPECIFIC OBJECTIVES

After completing this unit the participant should be able to:

1. Discuss in writing methods for modifying vocational programs using computers.
2. Discuss in writing sources of instructional materials for developing computer aided instruction.
3. Discuss in writing methods of sharing time, equipment, courses, and personnel.
4. Discuss in writing methods for using computers for handicapped students.
5. Discuss in writing ways to promote equal access to all trade areas.
6. Discuss in writing methods for using computers to overcome limited english proficiency.

UNIT I

INFORMATION SHEET

I. Course Modification for Vocational programs

A. Instructor Choice

1. Instructor will know what he can do with a computer in his own trade area after he completes units II-VII

2. Instructor will only modify what he wants and when he wants.

3. He can: (through the computer)

a. present new material: text/graphics.

b. ask questions/and get students answers.

c. interact with students.

d. simulate his trade skills.

B. Courseware

1. Courseware is course software.

2. There is not much post-secondary courseware available for instructors.

3. Through "User Friendly" software (called Authoring) instructors can develop courseware without knowing how to program a computer.

4. It should not be long before there is more post-secondary courseware if instructors begin developing their own and publishing.

C. Modification methods

1. Tutorial - the computer presents new concepts.

2. Information Library - the computer is used to hold information for students.

3. Drill and Practice - the computer is used as an assignment sheet to practice concepts.

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4. Problem solving - the computer can simulate trade situations with little expense.

5. Lab experiments - the computer can be used to do lab experiments cheaply.

6. Games - the computer can be used to play educational games which is a good way to learn.

7. Record keeping - the computer can be used to do all the score and grade keeping for students including their grade averages and class averages.

8. Give and Take - An advanced concept where students asks the computer questions and the computer replies with answers and questions of its own (like a teacher)

D. Teacher's Aide

1. The computer can help perform the functions listed under step C thus freeing the instructor to provide more one-to-one instruction and allow the instructor to both update himself and his course.

2. The aide(computer)can be situated either in the class, lab or some centralized location.

3. The student can use his own computer and the proper modem at home to "talk" to the "teacher aide" anytime during the day. This also depends on whether the school computer and student computer are compatible (the computer salesman will usually know this and if not the company representative will). The students could easily make up lost time or perhaps not get behind when unable to attend school.

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II. Instructional Material

A. Product (hardware) Instructions

1. With each piece of hardware (computer) there is a set of instructions.

2. If you have not bought your hardware you should consider the readability of the hardware instructions.

3. Since increased competition, hardware instruction readability has been improved. The instructions have been more "user friendly" (readable).

4. You can read and study manuals to find how to operate equipment or you can save time by finding a "friend" that has a computer like yours or a hardware representative to show you how to use your computer.

5. There are many friendly computers around. An example of one is the Macintosh. You only need to know how to read a "little" to be able to use the Macintosh (Apple).

6. The thing to remember is that you can read and understand the instructions.

B. Software Instructions

1. Besides having a "friendly" computer you have to have ($50 - $1800) to buy authoring software.

2. Authoring software makes it possible to develop instructional packages that include text; questions and answers; graphics; and student interactions all without knowing how to write programs.

3. Usually a software company will write author packages for major computer brands.

4. Ask advice. Just because a package has a high price, it may not do the things you want it to do.

5. If you don't have, don't want or can't get authoring, consider a graphics package.

6. Graphics packages allow the operator to draw certain kinds of graphs and do a certain amount of text. This may serve your needs.

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7. Again, ask advice from someone that is using the package you plan to buy.

8. If you can't get either of the two above, there are two other directions in which you can move.

9. The first way is to learn how to write programs for your computer and develop your own software. This way you aren't limited to what you can do.

10. Last, look for a CAD system. This is a computer that has a dedicated software package that allows the operator to draw anything. The sophistication depends on the price tag. The operator can also write text and perhaps ask questions and have students input answers.

11. CAD systems can be very primitive (the operator must actually know how to program) to very involved (all programming is done) and the operator merely pushes buttons to draw anything including "reducing" to "blowups" of data on a drawing.

12. Again, which system you have or direction you must move in, software is becomming more "user friendly" so it would pay you to shop before you choose.

C. Instructions (Units II-VII)

1. This instructional material begins with a section designed to help an instructor eleminate fear of computers. (cyberphobia, computerphobia) which is very common to those of us that were born B.C. (Before Computers).

2. Next the participant is encouraged to learn a little bit about what a computer can/cannot do.

3. This is followed with the participant grouping together with a partner (a system of checks and balances, if nothing else) to select a project that each would like to develop while completing these instructions.

4. The participant is then given the option as to the direction he/she wants to go, depending on how involved the project he/she has selected.

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5. The participant next designs the mechanics of his project. This is where he/she decides exactly how he wants to use the computer in his class/lab.

6. The options which are discussed in later unit are graphics, text, questions and answers, input and reaction and feedback.

7. The participant can select all or any combination of options that he/she wishes.

8. The participant also chooses, depending on the situation, how and where the computer is to be utilized.

9. Throughout the development process there will then be three sets of instructions readily available to help the participant - these instructions, hardware instructions and software instructions.

III. Time Sharing

A. What it is

1. Time sharing is the sharing of equipment. This is when one or more vocational programs share a computer or computers.

2. Time sharing is also the sharing of the same computers for different blocks of time.

3. When one visits a campus one observes often that computers are "property" of one program. This is alright if that program utilizes all the computer time.

4. Underutilization of a computer's time is the problem.

5. If a computer is not used for, say, two hours during the school day (8 hours), that computer is being underutilized 25% of the time which is no small amount.

6. If the computer is not being used more than six hours during the day (24 hours) it is being underutilized 25% of the time.

7. With proper time management the computer in the above example could be "time shared" and used by several programs instead of buying several computers.

8. The latter is usually what happens.

9. The idea is to use one computer by as many programs as possible and keep the machine working (Car ownership is an example of underutilization. Some of us spend a great deal of money for automobiles that we drive a total of, say 140 minutes per week. There are a total of 10,080 minutes in one week).

B. School Equipment

1. Computers can be found in science, engineering, drafting, computer science, etc.

2. Computers are usually not found in vocational programs such as diesel, auto, welding, etc.

3. These programs could easily utilize the CAI (computer-aided instruction) function of the computer. (Instructor engenuity).

4. These computers could be utilized better with the right directions from the right people and time management from a computer committee.

5. Time and equipment will be discussed in detail later.

6. It is suggested to not consider sharing a computer with the business office. It's work precedence (i.e. payroll).

7. If a computer has memory and can make decisions and, therefore, process information the computer is considered a smart terminal and can stand alone much like a human being.

8. If a computer (or what looks like a computer) has no memory, can't make decisions, and can't process data the computer is considered a dumb terminal and cannot stand alone.

9. Smart terminals can be used by vocational programs in different locations whereas dumb terminals have to be connected to a smart computer

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10. A series of dumb or smart terminals scattered around a campus and connected to a smart computer by hard wires, (actual cables in the ceiling or floor) or by telephone lines thru the use of a modem is called net-working. The smart or dumb terminals have to share time with the smart computer or main frame because they can not all "talk" with the main frame at the same time.

11. The ideal time sharing situation is when a series of microcomputers (smart) from different companies (Radio Shack, Apple, IBM, etc.) time share with a main frome through a protocol converter. The converter makes the main frame think that all the different brands of computer that "talk" with it are the same brand. The converter is like a language translator. (Every computer company has a little different language but through the converter companies can get along).

C. Industrial Equipment

1. Industry has been in the computer business a lot longer than education.

2. Since we are mainly concerned with vocational education all participants will have some degree of relationship with industry and thus computers.

3. If school computers are non-existant or unavailble serious consideration should be given to time sharing with friends in industry. The time to be shared by the school would normally be the evening or night hours.

4. But consider the benefits. If you use equipment from a related industry, that industry would have computer programs that, the instructor and his students could use to simulate industry problems.

5. These industry computers can sometimes be accessed through modem from a computer at school. Or even with the right industry connections a student could access industry computers from his home. (touchy!)

6. A student with his own computer and modem should be able to access school computers with no problems.

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D. Sharing Common Courses

1. While on the subject of time sharing, there might be occasion to use courses that other instructors have developed.

2. These courses may fit perfectly into your program and could be yours for the asking.

3. Or perhaps one or more instructors could develop a course they both could use.

E. Sharing with other Schools

1. If other schools have a computer and modem and you have a computer and modem, you should consider sharing computer courses with those programs that are like yours.

2. This sharing is good reason for instructors to fully document their work. When someone wants to use your work, or vice versa, he/she should be able to tell exactly what you've done from your documentation.

F. Electronic Mail and Bulletin Boards

1. If you have a computer and modem you can get acquainted (for a small fee) with people in your field by telephone. Here you and your friend must have a modem and computer. With a telephone call you can talk to your friend like teletypes do.

2. There are companies and individuals that set up their computers and leave them on so that you can access them through a modem and leave messages (electronic mail). This bulletin board function is very useful when used in conjunction with industry. Meetings, job and equipment are just three ways the bulletin board can be used.

G. Databases

There are many databases available throughout the country. A database is a huge storage of information usually grouped together by subject. It is similar to a library. (This can be used by students to obtain information that a small isolated school doesn't have.)

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IV. Modification for Handicapped

The arrival of low cost computers has opened educational doors for handicapped persons. It seems that one's imagination will be the only limit to the usefulness of computers.

A. Manual Handicaps

1. If a student can point or touch the monitor screen or keyboard, most software (author) can be used without modification.

2. For multiple choice answers the cursor can be stopped on the student's choice.

3. To go to the next page, the space bar is usually pressed.

4. The cursor can be moving and stopped by pressing the space key.

5. In fact, the screen can be scrolling and stopped or started by pressing appropriate keys.

6. If a student can only speak, there are computers that can be talked to (i.e. Texas Instruments Personal Computer). Using TI software, the user is told to respond with oral statements. This way the computer picks up the voice traits of the user. Then the student has control of the computer through voice, using different commands to go to the "next page" or select answer number "one" etc.

B. Visual Handicaps

If a student can not see to read the monitors, there are speech synthesizers that convert written text, questions, answers and instructions into speech. Then a student could listen to his lesson and respond in a normal way or perhaps by voice control if he/she so chooses.

C. Other Handicaps

1. There are times that students are temporarily handicapped. Speech synthesis or limited touch would be a good application to help keep the student from getting behind in much of their work.

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2. The student could be at home and through the use of his own or a borrowed computer keep up with the daily class work if it were on a computer.

3. If a student has a problem getting close to a table, light moveable keyboards make it possible to place the computer in a student's lap.

V. Promoting Equal Access in All Trade (Program) Areas

A. Backing

1. To insure success for equal access to programs, persons at the highest administrative level must totally support the program.

2. In the case of net working the person in charge of the main frame must answer directly the person or persons in the highest level of administration. User bias will be curtailed or eliminated.

3. If stand alone equipment is being used, a committee should be in charge of delegating computers to programs and they should be unbiased.

B. Location of Equipment

1. Equipment can be located centrally, say in a library. This will be inconvenient to students in cases where students need continuity, in class/lab and computer useage.

2. If computers are centrally located there has to be a way to effectively check out computers for blocks of time.

3. If using a main frame (network) your computer material (program) will be stored in the mainframe. Here your main frame time has to be allocated.

4 If using small computers, students must have access to computer material, say through floppy disks. These could be checked out by students in the library.

5. If computers are not located centrally, they can be assigned to different programs depending on usage.

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C. Computer Committee

1. Probably the best way to assure proper useage is to select a committee from vocational program users.

2. Networking

a. Placing terminals in a vocational program should be determined by the number of students in a program and the average amount of time the students will need the computers. This terminal placement should remain flexible (i.e. utilization records for each computer should be kept).

b. If terminals are placed in departments the committee should determine the priority for each department. This priority is placed in the main frame. This will allow users to log on and use the machine according to placement in a hierarchy.

1. FIFO Here a student requests to use the computer. The next availble slot is given to him. First in, first on.

2. This can be altered to allow another student on if the last request has come from a student that has been on recently

3. A determination needs to be made for instructors as well. Instructors usually are given top priority as they will be logging on to create/change instructional material.

4. There will usually be computer science students wanting to use the system. One way of handling this situation is to place computer students after the CAI students.

5. One other situation will arise and that is to decide what priority will off campus requests be given. Normally they should "be handled as lowest priority."

3. Stand Alone

a. Here the computer user committee must determine how to divide the computers by departments. The computer placement should be decided by department useage records. Again the committee should remain flexible. Changes could occur frequently or only on an as needed basis.

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b. Within departments time should be assigned in blocks. This way a student could sign for a time that would be convenient for him. It might be good to have a maximum time per week per student.

c. There should be the option of another student assuming a time slot if no one has signed on within ten minutes of their alloted time.

VI. Modification for LEP

Another excellent use of computer aided instruction is for students with limited english proficiency.

A. Use Special Instructor.

1. By involving instructors that are experts in particular language problems they easily modify existing material to insure that LEP students have an oportunity to learn.

2. If the problem is in teaching information to spanish students, you can bring in a spanish instructor or you might consider a proficient spanish student to make material modifications.

3. To make changes load your english text, question, answer graphics or interactions and either convert all the material or place language clues in appropriate places. After all changes have been made, save the modified material to a different memory location. Normally the old material will stay as it was in your storage medium (Please check this as different software could be different.)

4. For graphics all you might want to do is add labels in language familiar to students. This could be placed in parentheses.

5. One way of directing the student into their LEP area, would be to insert a question somewhere at the beginning of the lesson menu. The answer would branch the student to the area reserved for LEP materials. This gives the student the option to control which path he/she wants to pursue.

6. Another way would be to include a LEP option in the menu. The student would have the LEP option at the beginning.

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B. Language chips and Software

Consideration should also be given to purchasing software or chips (IC) that translate directly from english to spanish for example.

INTRODUCTION TO COMPUTER GRAPHICS

UNIT II

INFORMATION SHEET

I. Computer Acceptance Groups

This course assumes that the participant is an educator that does not know how to program a computer and possibly will never need to learn to program (unless bitten by the overwhelming desire).

A. Cyberphobia - the fear of computers - is a typical affliction of millions of Americans.

B. Weinberg attributes this fear to individual feeling of lost control.

C. Kelman and Calkins believe teachers range somewhere between apathetic and hostile.

D. Lichtman's 1979 study showed that as a function of distance educator's attitude toward computers has changed:

1. From over 40% acceptance as long as the computer was not directly involved to

2. above 30% acceptance if there was a computer available in the classroom

3. to about 20% acceptance, if they actually had to have a computer in their possession.

(NOTE: If you fit in any of the three categories above, read on.)

II. Degrees of Cyberphobia

A. Please answer the following with a check in the column of your choice.

	YES	NO
1. It takes a special aptitude to use a computer.	___	___
2. Someday computers will control everyone and everything.	___	___
3. If I don't learn to use a computer, I will lose my job.	___	___

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	YES	NO
4. There isn't any real way that I could uses a computer in my classes.	___	___
5. Small computers, like the ones in discount stores, can't do anything important.	___	___
6. I will probably become a computer freak if I learn to use one.	___	___
7. I would rather work with people than a computer.	___	___
8. It would take entirely to much time to learn how to use one.	___	___
9. You have to be a genius to understand a computer	___	___
10. No one else in my field uses one.	___	___

(NOTE: If you answered "yes to more than 7 out of the 10 statements, you qualify as a certified "cyberphobic" as do most of your fellow educators.)

B. Responses to Questions

1. "Yes"for 1, 8, and 9. It's amazing, as you will learn in later units, the many fields that are using computers and the software being sold that require that you only know how to read and to point your finger at a screen.

2. "Yes" to 2, 3, and 7. Since you are concerned with the human use of computers, you will be able to teach your students how to use computers in their work and teach them to pull the plug if they feel they are losing control.

3. "Yes" to 4. In Unit II, you will develop a project that you can use in your class or lab.

4. "Yes" to 5. The world is undergoing a computer revolution because computers have become smaller and capable of doing important things quicker, and people can now afford the low cost.

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5. "Yes" to 6. You will become an educator that uses a computer to make teaching easier and more fun for you and your students.

6. "Yes to 10. As you work your way through the following units you will learn about different methods available that will make your work easier.

III. Myths About Computers

A. You don't have to know how to program a computer to use one. Computers are becoming more "user friendly." They are being taught to respond to you and your language.

B. You can't hurt a computer unless you hit it with something!

C. Computers can't "take over" since they do nothing unless you tell them - you are in command!

D. If you're afraid of making mistakes-go ahead and make them. Only the computer will know and it won't remember them unless you tell it to. You've got to make your quota anyway!

IV. Preparing to Use a Computer

A. Get your attitude in shape. Decide you want to learn how to use a computer. When you decide you want to, your "mind" will work with you.

B. Decide what bothers you about learning this new skill. Make a list.

C. This list of what bothers you is only feelings or a state of mind. It's something that you can change.

D. Look at the things you've accomplished.

E. You've accomplished other things--learning this new skill is just another trophy to add to your collection.

F. Learn the terminology. Really that's all a lot of people know about many things.

G. Go where computers are. Expose yourself to them either in labs, stores or friend's houses. They just sit there, don't they?

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H. Get your hands on one. Look for an operation manual and read to locate switches and controls.

I. If possible, find a computer that has instructions for a game to play or some simple sequence of steps they you can perform.

J. After making the computer do something for you- try something a little more involved. All the while keeping your attitude on the right track.

K. Now continue on with these instructions. From time to time, you will be asked to add to your skills. (i.e. practice and more practice).

V. Course Material Profile

A. These instructions are written so that a participant can skip information and work that is not wanted. On the other hand, a participant can also begin at his/her level to increase skills. That is, work that has been done can be added to at a later date.

B. General instructions for getting acquainted with equipment will be covered.

C. Participant will learn what a computer with and without an "author" system can do.

D. Participant will select a project that they will use in class or lab.

E. Detailed design steps to accomplish the project will be covered.

F. Methods to accomplish detailed design steps will be discussed. Participant will use their computer to test their project as the project is developed.

1. Graphics
2. Text
3. Interaction
4. Input/Reaction
5. Feedback

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VI. Different ways of Utilizing a Computer in a Class or Lab

A. Overhead transparencies.

B. Disseminate information.

C. Working sample problems.

D. Working sample experiments.

E. Reinforce lectures.

F. Simulate expensive lab experiments.

G. Simulate real time experience.

H. Simulate long time experiments by contracting the time element.

I. Simulate prohibitive experiments repeatedly.

J. Introduce the students' interaction into experiments. (i.e. stop action)

K. Safely run dangerous real life experiments.

L. Administer a test when a student is ready.

M. Grade and record grades.

N. Give immediate feedback on incorrect problems.

O. Incorporate student's material and/or problems into games with rewards.

P. Maintain private student records.

Q. Take care of all class accounting.

(NOTE: You should look through your computer's user manual for other applications. This list is really endless. . . the participant's imagination is the only constraint to what is possible.)

VII. Selecting a Partner

A good way to work through this instruction set is to work in groups of two. This way, your partner can critique your project efforts. Therefore, select a partner that you feel won't offend you by telling you what is wrong with your project.

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VIII. Selecting Project Objective

Now choose a project that you will feel comfortable with and that will benefit your students. Later you can easily return and edit your project and add/delete what you want. (This is easy with authoring software but usually difficult without.) Put your ideas down on paper.

IX. Discussing Project Objective

After refining your project ideas, explain your project to your partner. Check to see if your project is feasible for use on a computer. If you both feel it's not right, redo Items VIII and IX.

X. Computer Terms and Definitions

(NOTE: Since you won't be writing programs many of these terms will not be necessary except as part of the language.)

A. Arithmetic Unit - The part of the central processing unit that carries out arithmetic operations. It adds, subtracts, multiplies, and divides. It is sometimes referred to as the number cruncher.

B. Binary - Binary numbers have the base of 2. Therefore, they are either a 0 or a 1. Numbers are made up of strings of 0's or 1's. Computers process information by a strong electrical impulse, 0 by a weak one. Using the on-off states, computers can process information very quickly.

C. Bit - The word Bit comes from the two words binary digit. A bit is a single digit in a binary number; for example, 10011 is composed of 6 bits.

D. Bug - An error in a computer program is called a bug.

E. Bundled - If the software is sold as part of the computer system, it is bundled. If the software is sold separately it is unbundled.

INFORMATION SHEET

F. Byte/Bits - A byte is the number of bits needed to encode one character of information in any given computer system. This number varies from computer to computer, but in minis, usually two bytes of 8 bits each form a word. Newer micros process 16 or 32 bits at a time, making them faster than "8-bit" systems.

G. Cathode Ray Tube (CRT) - This is an electronic tube like a TV tube and it is the screen that you see the computer output displayed on.

H. Central Processing Unit (CPU) - This piece of hardware is the heart of the computer system. It processes the data and controls the sequence of operations performed by the computer.

I. Coding - Coding involves transforming information from one form to another. For example, you could encode decimal data into binary. If you decoded the data, you would return it to its original form. In relation to programming, coding means writing programs in a computer language. The word is sometimes used interchangeably with programming.

J. Computer - Usually people use "computer" to refer to the entire computer system including the CPU, peripheral devices, and software.

K. Control Unit - This is the part of the central processing unit that directs the order in which the computer processes information.

L. Data Base - Built out of software, a data base is a construct for storing, organizing and retrieving information. For example, names, phone numbers, and addresses could be stored in a data base. Someone could use the data base to list all addresses with a certain zip code or all people who have a specific area code.

M. Debug - Even the best software has small errors or bugs in it. The process of finding and fixing these errors is called debugging.

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N. Diskette - Known also as a floppy disk, this is a small square piece of plastic that is used as a magnetic recording device to store information from microcomputers. The diskettes may be one or two-sided and cost only a couple of dollars.

O. Distributed Processing - This allows people on different floors of a building, or even in different cities to use the same computer. Each person has a terminal that is connected to the main computer by phone, or other communication lines.

P. Down/Down-Time - "Down" refers to the computer not functioning. "The system's down" means the computer isn't working. Sometimes there is scheduled down-time for routine maintenance.

Q. Drive - A drive or disk drive is a piece of hardware that saves data to magnetic material, tape, floppy disks, or hard disks. The drive can also read the data back into the internal memory of the computer.

R. Hard Copy - Output from a computer that is produced on paper, or some other permanent media such as acetate overlays, or 35mm slides, is called hard copy.

S. Hardware - This constitutes the physical equipment that makes up a computer system.

T. Input Device - A piece of hardware that lets a person put data into the computer. Input devices include keyboards, light pens, joy sticks, and touch sensitive screens.

U. Internal Memory - This is an area of the computer that stores information that somebody is working on. The computer can store an infinite amount of data on disk or tape, but it can only store a very small amount of data in internal memory.

V. Log On/Off - When computers users turn their terminals on and connect to the mini or mainframe computer, they are logging on. Usually this process involves the users identifying themselves and typing a password into the computer. When the session is over, users tell the computer they are done. They are logging off.

INFORMATION SHEET

W. Modem - A modem is a hardware device that lets you use phone lines with your computer or terminal to communicate with other people or computers in different locations. A cable from the modem hooks into the computer or terminal. A phone receiver hooks into the modem. A programmer might use a modem with a terminal at home to hook up to the computer at work.

X. Network - A computer network lets people connect remote terminals to computers or computers to computers. The computers and terminals can actually be wired together or they can use a standard phone line by attaching a modem and telephone to the computer. The computers send signals over the phone line.

Y. Program - A set of instructions written in a symbolic code called a programming language. The program tells the computer to do specific things in specific contexts-for example, a program tells the computer to look through data and find every number smaller than fifty. then to multiply all the even numbers less than 50 by the next highest odd number.

Z. Programming Language - A set of instructions or symbols and rules for using them to write programs. Each language is used for specific types of applications. For example, COBOL is used to program for business problems and FORTRAN is used for mathematical and scientific problems.

AA. RAM (Random Access Memory) - This is part of the computer's internal memory where information can be accessed very quickly in any part of memory. Information can be written in or read out of this part of memory this way.

BB. ROM (Read Only Memroy) - ROM is a pre-programmed part of memory. It is, in fact, like the instincts and drives that are programmed into humans before we are born. The ROM has basic information that cannot be altered by the computer user.

INFORMATION SHEET

CC. Software - Software is the instruction part of the computer system. It tells the computer what to do from step to step. Software programs make the computer a useful tool for people. Author is a software program that enables the computer operator to write text and graphics into the computer and have this information available for later use.

DD. Terminal - A device that lets you receive or send data to a computer. Usually it's a keyboard and printer, or keyboard and a CRT. Don't confuse personal computers with terminals. Terminals are just for sending and receiving information (data); personal computers actually process the data.

EE. Up/Uptime - The time when a computer is running without any troubles. When the system's up, it's functioning normally.

FF. User-Friendly - A term used to describe a software package that's easy to use.

DESIGNING A PROJECT

UNIT III

OBJECTIVE

After completing this unit, the participant should be able to choose between learning methods and design a learning project that follows a model, guidelines and utilizes both a computer and support material to teach student skills in the student's field. This knowledge will be shown by completing an assignment sheet and job sheet.

SPECIAL OBJECTIVES

After completing this unit the participant will be able to:

1. Select one or more ways to use a computer in a project.
2. Decide which learning method to use in their project.
3. Name specific objectives and how to attain them.
4. Discuss a learning model.
5. Design a learning project which utilizes the computer.
6. Demonstrate the ability to:
   - A. Locate and name the pertinent parts of a computer utilizing the computer manual
   - B. Utilize a computer to perform some pertinent function (loading software that does something).
   - C. Design a project.

DESIGNING A PROJECT

UNIT III

INFORMATION SHEET

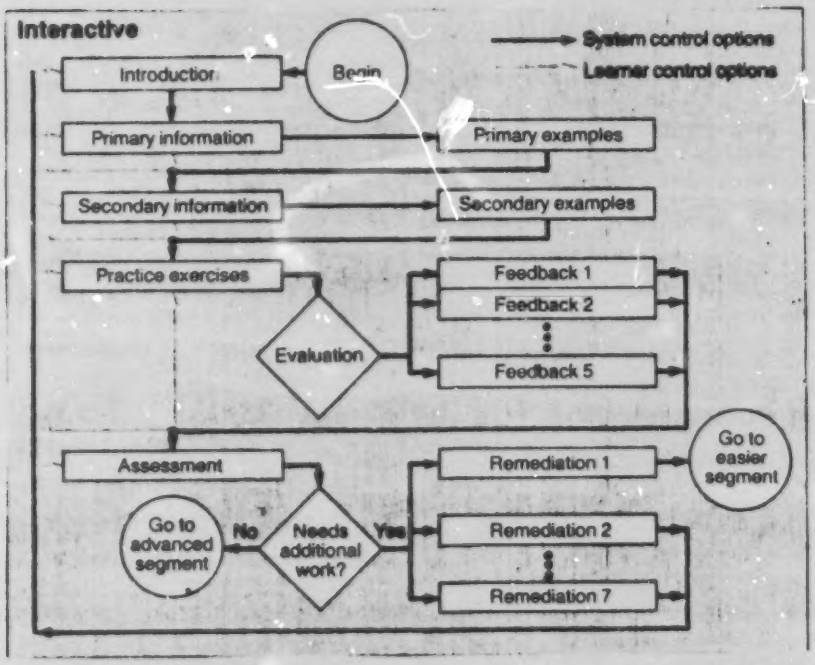
I. Computer Uses

(NOTE: Now that you have an idea of what makes up a computer and feel more confident about using and controlling THE MACHINE, let's look at some things that a computer can do. The following seven items are not in any specific order of difficulty. (The items are here to give you ideas for your own project.)

A. Tutorial

1. Teach new concepts which could include student interaction and scorekeeping.

EXAMPLE: Following is an involved flowchart to suggest what could be done. As you will soon see, feedback is important and so is the remediation branching. You may feel that you aren't ready for such an involved project and that's alright. You can add feedback and remediation later.



INFORMATION SHEET

2. Text/Interaction.

EXAMPLE:

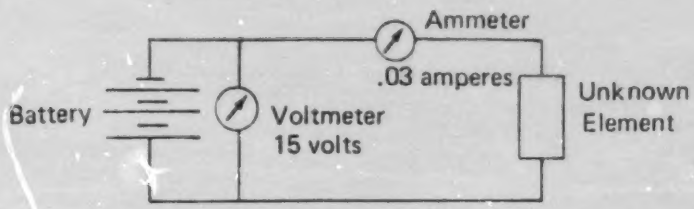
Information: A resistor has .05 amps of electrical current passing through it. The resistor has 5,000 ohms of resistance. What voltage potential is across the resistor?

Solution: E = IR
= .05 x 5000
= 250 volts

Interaction: A control relay coil is designed to operate with 2 amps of direct current. The coil resistance is 12 ohms. Applying Ohm's Law, what supply of voltage should the coil leave? _____(24 volts)

Or this method could include graphics with the text.

(EXAMPLE:)



What [illegible] resistance of the element?

_____ _____

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(NOTE: A student will be able to advance at their own pace which makes it more interesting for the student, both the slow and the fast ones.

Later you can add another set of information and problems so that a student that didn't catch the new concept the first time could take the alternate set the second time through.

You can also have encouragement through cues, prompts and clues.

In case a student knows the information before hand a short pretest would be a nice option so that the student could pass on to the next section.)

B. Information Library (data base)

Information under different headings can be stored and updated as necessary and be used by the student in assignments.

EXAMPLE: Terms, definitions, formulas and sample solutions can be used like a dictionary.

Student handouts can be stored and printed as needed, either one at a time or for a whole course.

Overhead transparencies can be stored and updated easily. Then be used in a lecture. Or with the text added can be used by the student if they miss the lecture. (Software graphics are available.)

If modems are used this information could be used between schools or departments in schools.

C. Drill and Practice

Here you use problems covering recently covered material to ensure that a student has learned. Or you could start a new lesson with drill and practice over material previously covered. The idea is not to cover new concepts.

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EXAMPLES:

1. Recalling steps in a procedure.

2. Use input and output flow; calculate nozzle size.

3. Timed drills over terms and definitions or safety procedures.

(NOTE: It would be "nice to have" levels of difficulty which a student could select. Again, this would be easy to add later on.)

D. Solving Problems

Students should be supplied with situations similar to what they would find in their world of work. (i.e. employers could be contacted for sample computer usages.)

Examples:

1. Electronic circuits with problems "wired" in. Locate faulty components.

2. With proper software have students "touch" malfunction on a graphic picture.

3. Build a machine to solve a specific problem then use the machine (conveyor in factory).

4. Have heat load generator (computer spread sheet) to which air conditioning students supply various heat loads and obtain air conditioner size.

INFORMATION SHEET

E. Simulation

This is where the computer is used to "model" real world experience. This method is especially useful where the "real world" experience or lab experiment would be too expensive, too dangerous or time consuming; therefore, the situation is simulated using a computer. Depending on your computer and software this method can be very elegant.

EXAMPLES:

1. Machine Shop - a block is presented to a student who is asked what cuts and holes are required to produce a specific item. The student then uses the computer to make the cuts and holes.

2. Robotics - the student is asked to interface (connect) the computer to a machine or system. The student then gives the computer the necessary commands to perform some work. Also good to control lighting, sound and temperature systems. The best set up would have a TV camera connected to the computer to simulate vision.

3. Flying - simulate instrument conditions with the computer and have the student "fly" the monitor and joystick. This simulation can get very involved, but more interesting if there are many reponses for a situation.

INFORMATION SHEET

4. Geologic - one piece of software predicts when a volcano erruption will occur. The student must find out what set of conditions have been set into a particular volcano (computer).

5. Business - a spreadsheet can be developed to simulate any business activity and with students input, the results are immediately available.

(NOTE: Visiting with employers will give you good ideas as to what you might simulate).

F. "Learning" Games

Learning can be considered a game and when learning is combined with game playing in the right proportion, students will enjoy learning more. This is an excellent use for computers and time will be spent on developing this idea in the next section (II) of this unit.

G. Record Keeping

New software on the market tend to have more and more kinds of record keeping. Again, this is something that can be added later.

EXAMPLES:

1. Problems - maintain student scores and student average as well as class average.

2. Tests - maintain student test scores and student test averages as well as class test averages.

3. Progress - as a student completes a unit and completes and passes the unit test, the unit is locked so that the student can not redo his work without his instructors permission. Meanwhile the next unit is unlocked.

INFORMATION SHEET

4. Printing - output of a student's score, average score, test score, average test score, place in the class and progress can be printed.

5. Inventories - equipment and location can be maintained. Also an up-to-date record of which student has equipment checked out to him.

INFORMATION SHEET

II. Methods of Learning

Thomas W. Malone states in his report, What Makes Things Fun to Learn: A Study of Intrinsically Motivating Computer Games, student learning will take place if the student is challenged, if learning is in the form of a fantasy and if the students curiosity is aroused.

A. Learning through challenges. Learning is enhanced if students are challenged.

1. Goals should be easily seen.

EXAMPLE: If your student receives a license on completing your course which allows him to make more money and better his reputation, he will be more apt to be challenged to learn.

2. Goals should be on the proper difficulty level.

EXAMPLE: A machine shop student would need to know how to cut and drill before given a complex job involving both skills.

3. Goals should be related to your students' field.

EXAMPLE: Teaching a body shop student math for the sake of learning math generally won't work. But impressing the student through a goal of being able to do his job more quickly with math has a better chance of getting him to learn math.

4. Goal achievement. Students need to have goal feedback as they move along. They need to know if they are getting closer ~~or not~~ to their goal.

5. Uncertain outcomes, due to flexible difficulty level. Students won't be challenged if outcomes are predictable. This can be avoided by:

a. Increasing the level of, say, the drill and practice.

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EXAMPLE: A diesel student is first quizzed on injector parts then after mastering his definitions he adjusts the injector.

b. the student chooses the level at which he feels he is capable to start.

EXAMPLE: A business student feels they should be advanced therefore, they select an advanced bookkeeping lesson. If the student realizes they have started too high, they should have the option to select a lower level and start again.

c. selecting their entry skill level based on past performance.

EXAMPLE: An electronics student could select progressively more involved circuit problems till he found a level which challenged him.

6. Uncertain outcomes when there are multiple levels. If there are multiple entry levels a student unchallenged at one level can proceed to the next level or until he finds a challenging level. The student could find his level by:

a. scores on levels. The score could represent the number of tries and correct answers.

b. speed on questions.

c. response to situations that have varying degrees of hidden information. If one situation is easily solved the student progresses to a situation where the solution is not so evident.

INFORMATION SHEET

d. encountering situations that have increasing random uncertain outcomes.

EXAMPLE: Some video games have increasing randomness levels built in. Easy solutions proceed to a level where predicting solutions become difficult.

B. Learning through fantasies. Learning is enhanced if it is in the form of a fantasy. No - fantasy computer learning involves only abstract symbols. So, use intrinsic fantasy.

1. An intrinsic fantasy is where you simulate a situation in which a skill is being taught.

EXAMPLES: Airplane pilots may not be interested in geography. But when a pilot plans a cross-country trip he learns all there is about the geography of the land he is flying over and the weather he will encounter while on his trip. You can say the pilot has been motivated to solve the problem of arriving safely at his destination by simulating the situation in which the skills of flying are used.

2. Students in different disciplines need to be placed in different fantasies in order to learn the same skill.

EXAMPLE: The concept of proportion by itself is really not all that interesting. But to a student pilot, many of the calculations he does involves proportion. Needing to know how to do calculations in order to fly, he learns the idea of proportion. On the other hand, a nursing student might stumble through the ideas of proportion. But in their chosen field they must quickly and correctly perform calculations that could cost patients their lives. The same idea in both cases - proportion. But different fantasies.

INFORMATION SHEET

(NOTE: The next step is to provide different simulations within the same vocation.)

C. Learning through curiosity. Learning is enhanced if the student's curiosity is aroused. In computer learning this can be done by visual and audio effects and feedback.

1. One of the pitfalls of audio (beeps) and visual (flashing graphics) effects is their overuse. You should try to use audio and visual computer responses for special occasions.

   EXAMPLE: Response to a changing lesson with an auditory sound is overuse.

2. Sounds and graphics are also excellent rewards for correct responses to completed questions. Of course, a negative response could be used with good effect.

3. The idea that a picture is worth a thousand words still holds true and is a very important part of computer aided instruction.

   EXAMPLE: The "talking" verbally and orally machine is startling! The machine graphically displays how much money you have deposited and then says something nice when you make your selection. This same idea can be used in the classroom.

4. Another way of looking at computer audio and visual responses is that this is feedback. Feedback is interesting if used randomly.

   EXAMPLE: Think how a student would feel if, when struggling with a response, the computer gives forth with a needed clue in the form of a graphic or oral phrase.

INFORMATION SHEET

5. Most important, feedback should be a learning situation and should reinforce and correct student's thinking.

   EXAMPLE: Orally or graphically, the Computer could say for a wrong answer some encouraging words such as "you almost got it!" "Try again, you're close!" or "Back up and read that problem again!"

III. Consideration Before Designing Your Project

Now that you have studied some uses of a computer and some methods of learning, let's review some instructional design ideas.

A. Determine specific objectives.

1. This depends on how long your project is:

   a. course - many sets of objectives.

   b. subject - perhaps several sets of objectives.

   c. day - one set of objectives.

   d. hour - a subset of objectives.

2. After determining the objective or skills to be mastered you need to put them in sequence.

   EXAMPLE: The student is to learn to use a marking guage in the construction of custom cabinet work.

   1. Name the parts of the gauge using a chart.

   2. Show how to adjust the head.

   3. Set the guage to desired measure.

   4. Check the set up with a rule.

   5. Hold guage in right hand.

INFORMATION SHEET

6. Run the gauge against the stock.

7. Darken with pencil if necessary.

8. Mark all pieces at the same time.

(NOTE: This is a good computer problem. After the student completes the lesson then he would try the gauge on his cabinetwork.)

3. Determine which ones are going to be done by the computer.

   a. If your project is to develop a set of overheads or handouts you won't be too interested in this step so go on to the next step.

   b. In step III, A. 2 all the steps could be done by a computer including the testing for good marking. Perhaps, the instructor could start the student off by explaining just how accurate and rapid the marking gauge is.

   c. The whole project doesn't have to be done by computer. It's good to have a mix of lecture, computer use, and handouts. But, on the other hand, you may be doing this to free up time for, say, slower students. Still there should be some instructor/student interaction.

4. Remember to consider what the student must know before starting on these tasks.

   a. A review may be in order - computer or lecture.

   b. A pre-test to measure the student's knowledge before unlocking the computer lesson could be used.

   c. Follow up should be taken into consideration also.

B. Develop a statement of how your project will fit into your classroom and curriculum.

1. This statement could use a flowchart of your project.

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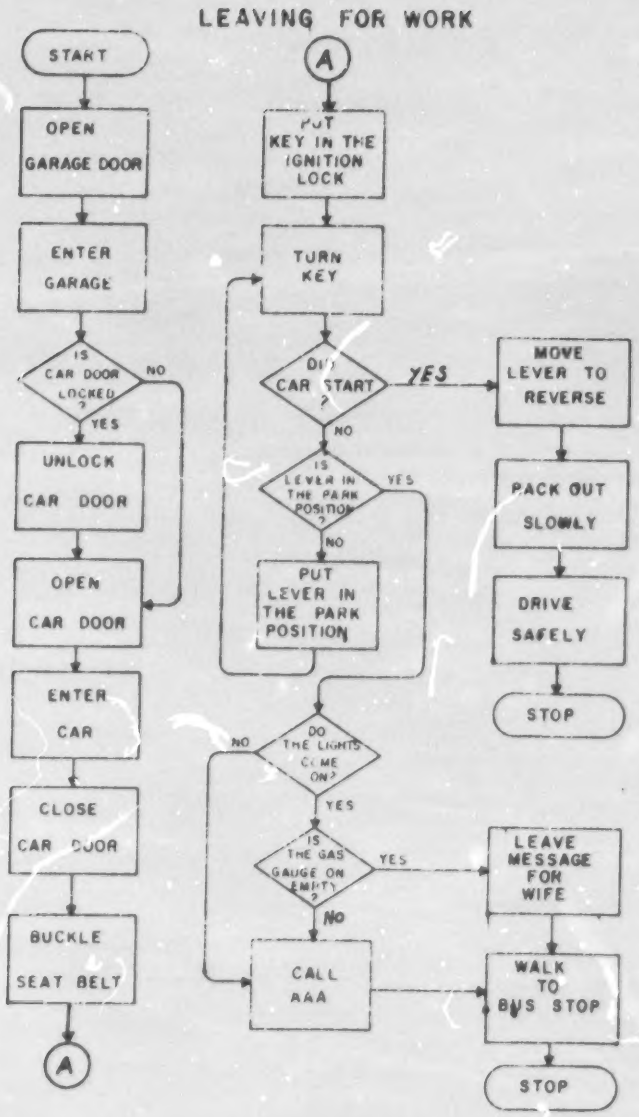
EXAMPLE: Flowchart



INFORMATION SHEET

2. This statement will assume you know where and how you are going to use the project.

3. Someone else (your supervisor or successor) will want to know exactly your procedures.

4. Try to document what you do but do it simply.

   EXAMPLE: Include text documentation with your flowchart.

C. List the tasks to be presented.

1. Make sure the easier ones are first - the idea is to build confidence.

2. In making your list, keep in mind the prerequisites.

3. List good examples for your tasks.

4. Again make good documentation.

D. Check to make sure the project is good for a Microcomputer.

1. Large amounts of reading material should be done off the computer. (The computer could store the volumes and be printed for the student to read at their leisure.)

2. If you are doing simulations, check to make sure it wouldn't be easier or more beneficial to be done in class.

3. Generally, if the discussion method would be better then do it off the computer. (Presenting information before the discussion would be good.)

4. Review Section I to see ways that a computer can add to learning.

5. Lastly, the idea is that instruction should be <u>better</u> through using the computer.

INFORMATION SHEET

E. Pick your strategy - using Computer Uses, Section I.

From what you have listed to do in your project select one or more of the uses. (i.e. tutorial, information library, drill and practice, etc.)

F. Determine what you are going to use to support your computer project and how it will be presented.

1. Where will your instructions be? (computer, instructors, or handout.)

2. Will other material be in the computer?

3. It is a good idea to try to use the instructor plus the computer unless making more free time is the reason for your using a computer. What about using instructions from the instructor/computer?

4. Your finished project should achieve your specific tasks and keep the student's interest.

IV. A Design Guide Line

Now that you have your project defined you may find the following design guideline by Robert Gagne' to be useful.

(NOTE: It would be good if these ideas were included in your project somewhere. The order presented here is also suggested.)

A. Get student attention

1. Be as crafty as you can in getting your student's attention - review Section II for the different methods of learning.

2. Your students may require that you change methods from lesson to lesson.

B. Present objective to student

This could be done by the computer or through a series of handouts. (i.e. an introduction)

C. Review previous learning - could be included in:

1. instructor lectures and/or

2. assignment sheets and/or

3. computer assignment.

D. Present student new material

How this is done depends on the method of learning you have selected.

EXAMPLE: On the same screen a small amount of new information can be followed by drill and practice.

E. Supply student with learning direction

1. Direction can be given with new information and concepts.

2. Direction can be given in examples.

3. Direction can be given in hints, clues, or questions.

F. Provide student with computer interaction

After a student has received new learning stimulus there should be immediate interaction to determine whether learning has taken place.

EXAMPLE: See Step D for a sample.

G. Respond to student interaction

Recall that feedback should be positive and helpful. Means to return to Step E should be provided if the student has not learned.

H. Determine student performance

1. Audio and/or video "attaboy".

2. If the student has not learned, means to return to Step E should be provided.

3. Students should feel that they have accomplished something. Try to bolster self-confidence.

INFORMATION SHEET

I. Reinforce student learning

Approach learning through different methods or different drill and practice. The point is to make sure learning has taken place and that the student can transfer their knowledge.

EXAMPLE: Have next section start off with problems requiring skills and knowledge from the previous section.

V. The Project Format

A. With a good idea of the different methods available and your project detailed you should design the project. Included in this section (V) is a sample curriculum design that is especially useful. You may want to pattern your work after it.

(NOTE: This method was obtained from the Curriculum and Instructional Material Center (CIMC), Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, OK 74074.

B. A way to use the CIMC method is to write the:

1. unit objective.
2. unit specific objective.
3. information sheets.
4. assignment sheets.
5. job sheets.
6. test.
7. answers.
8. suggested activities.

C. CIMC Curriculum Format

TEACHING UNITS OF INSTRUCTION

UNIT OBJECTIVE

After completion of this unit, the participant should be able to teach units of instruction. This knowledge will be evidenced through demonstration and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the participant should be able to:

1. Match terms associated with teaching units of instruction to the correct definitions.
2. Select from a list advantages of teaching with a unit of instruction.
3. Match components of a unit of instruction to the correct functions/descriptions.
4. Arrange in order four stages for successful teaching-learning process.
5. Select from a list advantages of using student material.
6. Discuss management of student material as related to dissemination and storage.
7. Name instructional methods for teaching a unit of instruction.
8. Select from a list sources of supplementary instructional materials.
9. Discuss ways to localize and personalize a unit of instruction.
10. Select from a list ways to use and administer a unit test.
11. Discuss factors which affect long-range program planning.
12. Select instructional methods which could be used in teaching a unit of instruction.
13. Demonstrate the ability to teach a unit of instruction.
14. Make a plan to teach units of instruction included in an instructional materials manual.

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TEACHING UNITS OF INSTRUCTION

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

A. Provide participant with the objective sheet.

B. Provide participant with information and assignment sheets.

C. Make transparencies.

D. Discuss unit and specific objectives.

E. Discuss information and assignment sheets.

F. Write *Teaching a Unit of Instruction* on chalkboard vertically. Use letters to form types of instructional methods.

Example:
LECTURE
E
AUDIO VISUAL
C
H
I
N
G

G. Use a variety of teaching methods in teaching this unit of instruction.

Examples: Develop crossword puzzle, play "Hangman," or play "Concentration" for objective one. Use word-a-gram for objective eight.

H. Provide units of instruction for participant to complete Assignment Sheet #2.

I. Plan to localize objectives eleven and fourteen to program area.

J. Give test.

K. Reteach if necessary.

II. Unit references:

A. Patton, Bob G.; Benson, Ann; and Braker, Clifton R. (Pete). *Writing, Teaching, and Supplementing a Unit of Instruction.* Stillwater, Oklahoma: State Department of Vocational and Technical Education, 1975.

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B. Patton, Bob G. *Curriculum Management.* Stillwater, Oklahoma: State Department of Vocational and Technical Education, 1976.

C. Benson, Ann. *Curriculum Development Philoscphy.* Stillwater, Oklahoma: State Department of Vocational and Technical Education. 1976.

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TEACHING UNITS OF INSTRUCTION

INFORMATION SHEET

I. Terms and definitions

A. Unit of instruction--Materials and/or information necessary for one or more class periods for the teaching-learning process in order to reach the unit objective

Examples: Objectives, suggested activities, information sheet, assignment sheet, job sheet, transparency master, test, answers to test and assignment sheet(s)

B. Lesson plan--Plan of instruction for a single class period

Examples: Instructional objectives, learner activities, teacher activities, assignments, time estimates

C. Unit objective--Statement of the intended purpose (overall behavioral outcome) expected of each student after completion of unit of instruction

Examples: After completion of this unit, the student should be able to service the fuel system. This knowledge will be evidenced through demonstration and by scoring 85 percent on the unit test.

After completion of this unit, the student should be able to dress a mannequin and make a tray-cut case. This knowledge will be evidenced through demonstration and by scoring 85 percent on the unit test.

After completion of this unit, the student should be able to apply a simple sterile dressing. This knowledge will be evidenced through demonstration and by scoring 85 percent on the unit test.

After completion of this unit, the student should be able to dissemble/assemble a small gasoline engine. This knowledge will be evidenced through demonstration and by scoring 85 percent on the unit test.

After completion of this unit, the student should be able to make an unlined drapery. This knowledge will be evidenced through demonstration and by scoring 85 percent on the unit test.

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INFORMATION SHEET

D. Specific objective–Statement of performance to be achieved in order for the student to be able to reach the unit objective

Examples: After completion of this unit, the student should be able to:

1. Identify types of fuel filters.
2. Arrange in order the steps in creating a display.
3. List the methods of sterilization.
4. Distinguish between a two-cycle and four-cycle engine.
5. Identify measurement points on a window.

E. Learning–Change in behavior due to an educational experience

F. Components–Parts of a whole

(NOTE: Components of a unit of instruction include objectives, suggested activities, information sheet, assignment and/or job sheets, transparency master, test, and answers to test.)

G. Motivation--Process of stimulating the need or desire to act (Transparency 1)

H. Personalize--Make unit of instruction relevant to individual (Transparency 1)

I. Localize--Make unit of instruction relevant to community (Transparency 1)

J. Criterion-referenced evaluation--Device(s) used to determine student achievement of a predetermined set of objectives

(NOTE: Evaluation techniques should be performance-based. The activities may be oral, written, or manipulative.)

K. Management--Process of directing and controlling factors and implementing teaching plans for the teaching-learning process

L. Dissemination--Process of handing out materials or objects

II. Advantages of teaching with a unit of instruction

A. Provides more time for determining how to teach rather than what to teach

B. Can shorten training time of some students

C. Focuses all resources toward a measurable goal

D. Helps teacher to identify individual learning needs of student

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INFORMATION SHEET

E. Enables instructor to use time more effectively

III. Components of a unit of instruction (Transparency 2)

(NOTE: Depending on the specific objectives, items D, E, and F may or may not be included in the unit of instruction.)

A. Objectives

(NOTE: Objectives can be modified, deleted, or added in order to meet needs of student(s) and community. Objectives should be provided and kept in front of students during teaching-learning process.)

1. Communicate the performance expected of students after completion of unit of instruction

2. Help determine teaching strategies/instructional methods

3. Express evaluation criteria

4. Can be used as a pretest to determine prior knowledge of students

B. Suggested activities

(NOTE: This component is included only in teacher material.)

1. Assist teacher during preparation stage of teaching-learning process

2. Provide suggestions for teaching-learning activities

Examples: Motivational points, use of films or filmstrips, suggestions for resource people or field trips

3. List references used in development of each unit

C. Information sheet

1. Provides the "must know" content in order for student to reach unit and specific objectives

(NOTE: Teacher may add additional "nice to know" information.)

Examples: Teacher can use as a planning page in order to personalize and localize unit of instruction

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INFORMATION SHEET

Student can use to take down additional information from teacher, resource person, or during field trip

Teacher can make copy and give to potential resource persons

2. Provides supportive information in the form of notes, examples, and/or cautions

D. Transparency master

1. Provides illustration for "identify" objectives

2. Assists with clarification and reinforcement of unit information

E. Assignment sheet

(NOTE: Teachers should review assignment sheets BEFORE dissemination to students in order to anticipate questions, problem areas, and points for discussion and clarification. Not only can assignment sheets be personalized and/or localized, they can be duplicated and given to students until desired proficiency is reached.)

1. Allows opportunity for appropriate practice activities

2. Provides problem-solving, self-assessment, and paper-pencil activities

F. Job sheet

(NOTE: An instructor should demonstrate to students the procedures outlined in each job sheet. Furthermore, the instructor needs to localize the job sheet accordingly to the equipment and supplies available in the local lab or shop situation. Job sheets can be put in plastic covers to keep them clean for future use.)

1. Provides list of equipment, tools, and materials needed to complete a manipulative skill

2. Describes step-by-step procedure needed to complete a task or job

3. Provides diagrams, photographs, and illustrations to assist student

G. Test

(NOTE: Tests are collated all together at the back of the student material.)

1. Provides criterion-referenced evaluation

2. Can be used to determine needs of students

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3. Provides a means of accountability

(NOTE: Achievement can be evaluated through the use of pretests and posttests; six week, nine week, and semester testing; and checklists for skill performance. Achievement can be recorded on progress charts.)

H. Answers to test and assignment sheet(s)–Assist instructor in evaluation of student performance

(NOTE: These components are included only in teacher material.)

IV. Four stages for successful teaching-learning process (Transparency 3)

A. Preparation stage

Examples: Review the objectives and unit content; read suggested activities; plan teaching strategies; select and disseminate student materials

B. Delivery (presentation) stage

Examples: Implement plans for motivation, use teaching strategies, disseminate materials

C. Application stage

Examples: Students participate in learning activities and complete job and assignment sheets

D. Evaluation stage

Examples: Students take test and demonstrate motor skills; teacher reteaches if and where necessary; proficiency is documented

V. Advantages of using student material

A. Should increase learning potential

B. Provides student with basic information on which to build

(NOTE: Student's personalized copy can be used as a reference for employment.)

C. Provides student with plan of action

D. Provides means for make-up work

E. Saves instructor time

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VI. Management of student material as related to dissemination and storage

A. Methods of dissemination of student material

1. Unit at a time
2. Parts of a unit
3. Entire manual

B. Storage of student material

1. Place entire manual in student binder at the beginning of school year (Transparency 4)

(NOTE: Tests should be removed before dissemination!)

2. Separate and file according to units and parts of a unit (Transparency 5)

VII. Instructional methods for teaching a unit of instruction (Assignment Sheets #1 and #2)

(CAUTION: Instructional methods are only effective with thorough understanding of subject matter and technical content.)

(NOTE: Any combination of these methods and/or additional methods could be used in a single unit. Background of class, physical facilities, availability of resource materials, and community influence choice and selection of instructional methods.)

A. Audiovisuals

Examples: Films, filmstrips, audio tapes, video tapes, bulletin boards, posters, mobiles, sound page, actual objects, attention-getters

B. Resource library

C. Resource persons

D. Field trips

E. Demonstrations

F. Games and simulations

G. Case studies

H. Role play

I. Peer teaching

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J. Individual and/or supervised study

K. Lecture

L. Discussion

M. Personal experiences (teacher and student)

VIII. Sources of supplementary instructional materials

(NOTE: Any combination of these sources and/or additional sources may provide supplementary instructional materials.)

A. Industries

B. Extension services

C. Local businesses

D. Newspapers

E. Magazines and trade journals

F. Book companies

G. Film libraries

H. School personnel

I. Government agencies

J. Community people

K. Labels

L. Operators' manuals

M. Students

IX. Ways to localize and personalize a unit of instruction

A. Localizing

1. Apply units to needs in community

Examples: Field trips, resource people, home visits coordination visits, supervised farm visits

2. Use advisory committee

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INFORMATION SHEET

B. Personalizing

1. Relate to students' occupational objectives

2. Include students in planning

3. Allow students to write additional information in student material

X. Ways to use and administer a unit test

(NOTE: Proper testing procedures will help in identifying student weaknesses, directing student study, and verifying student's achievement of objectives.)

A. Use as a pretest

B. Give at the completion of each unit

C. Divide test into smaller tests to fit teaching-learning styles

D. Use test in parts to check progress throughout unit

E. Modify, add, or delete test questions according to modifications, additions, or deletions of objectives

F. Sample for nine week or semester testing

XI. Factors which affect long-range program planning

(NOTE: Curriculum is a total educational process that involves the relationship of staff, budget, facilities, students, extracurricular activities, and instructional materials. See Transparency 6.)

A. Determine time available for instruction

Examples: Outside activities, seasons, weather, type of program, competitive events

B. Sequence units of instruction

(NOTE: Consider difficulty of unit content, seasons, and competitive events.)

C. Consult advisory committees

(NOTE: The advisory committee will help prioritize units according to regional and local employability needs.)

D. Determine physical facilities and equipment available

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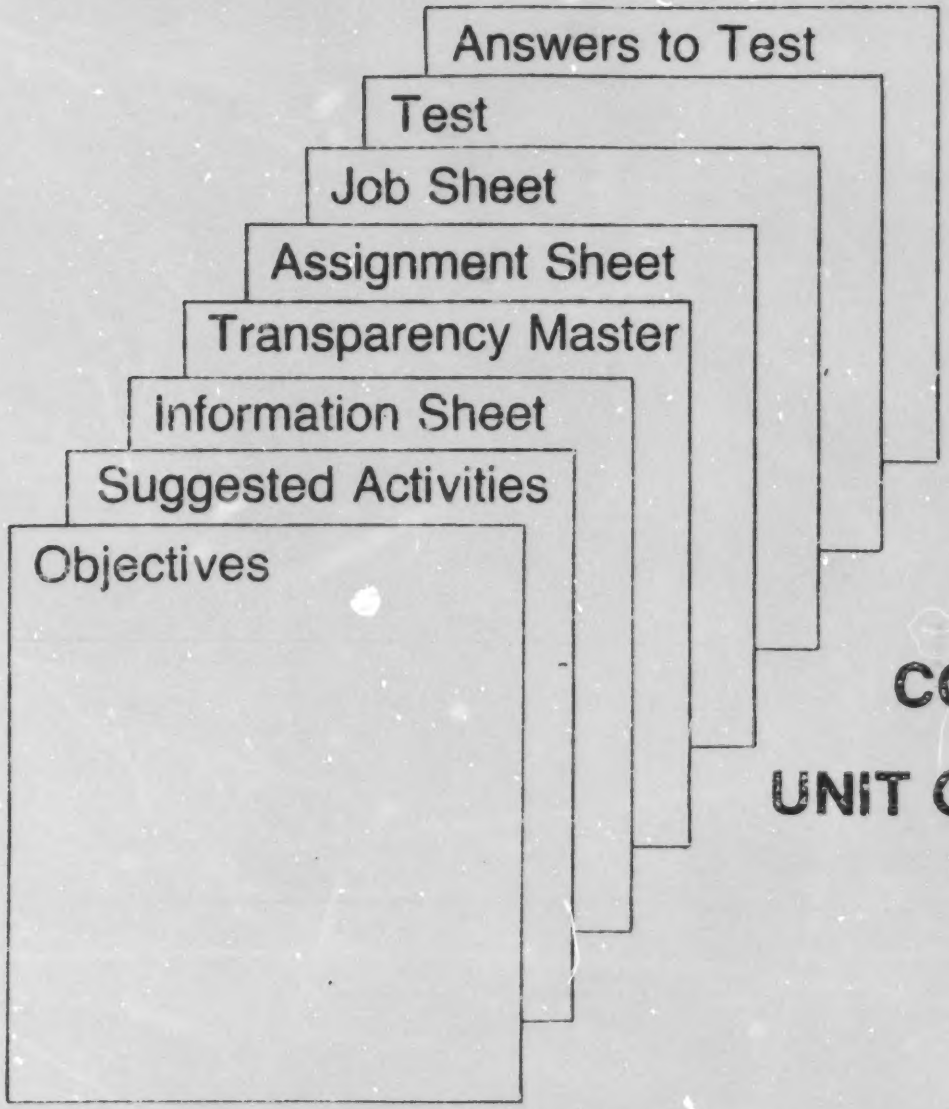
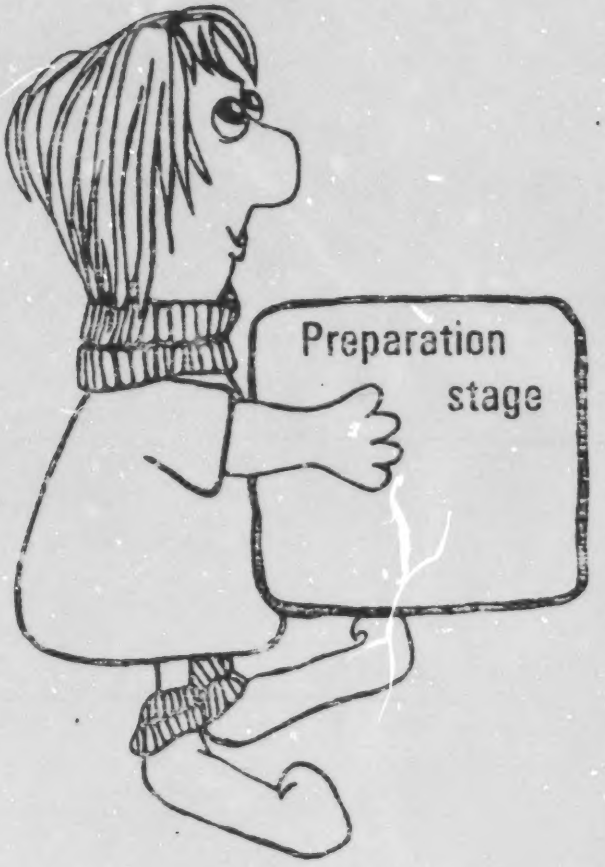
TM 1



COMPONENTS OF A UNIT OF INSTRUCTION

Prepare to Teach

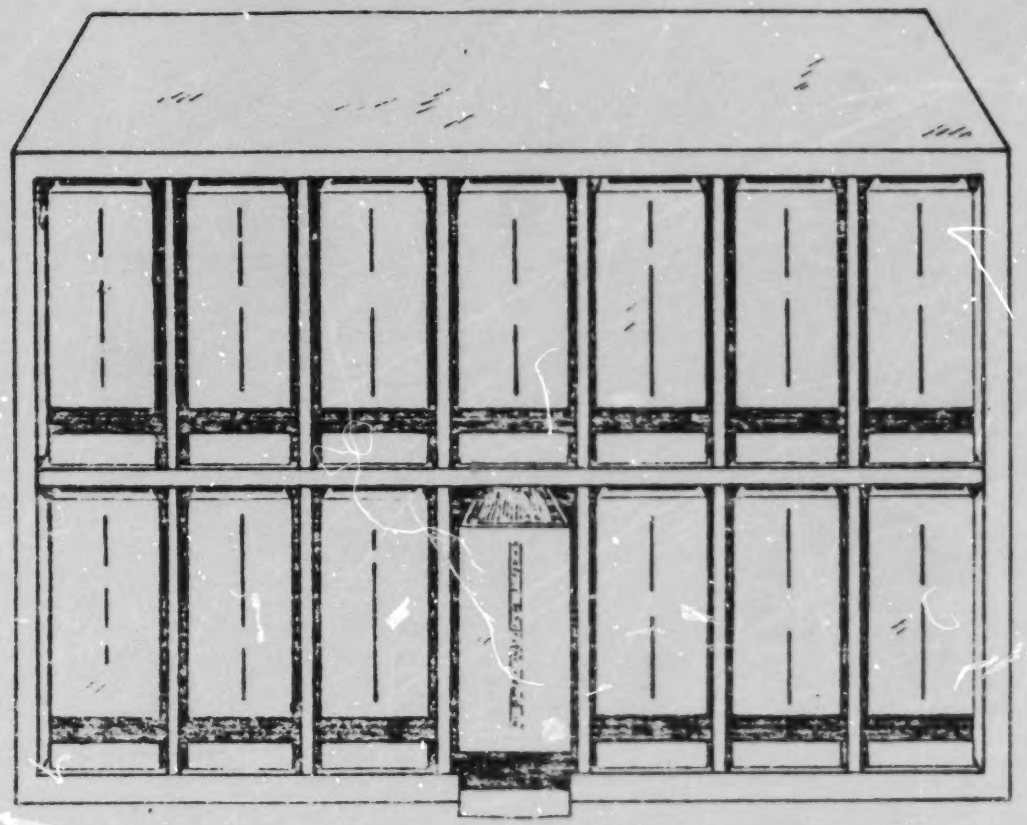


Delivery

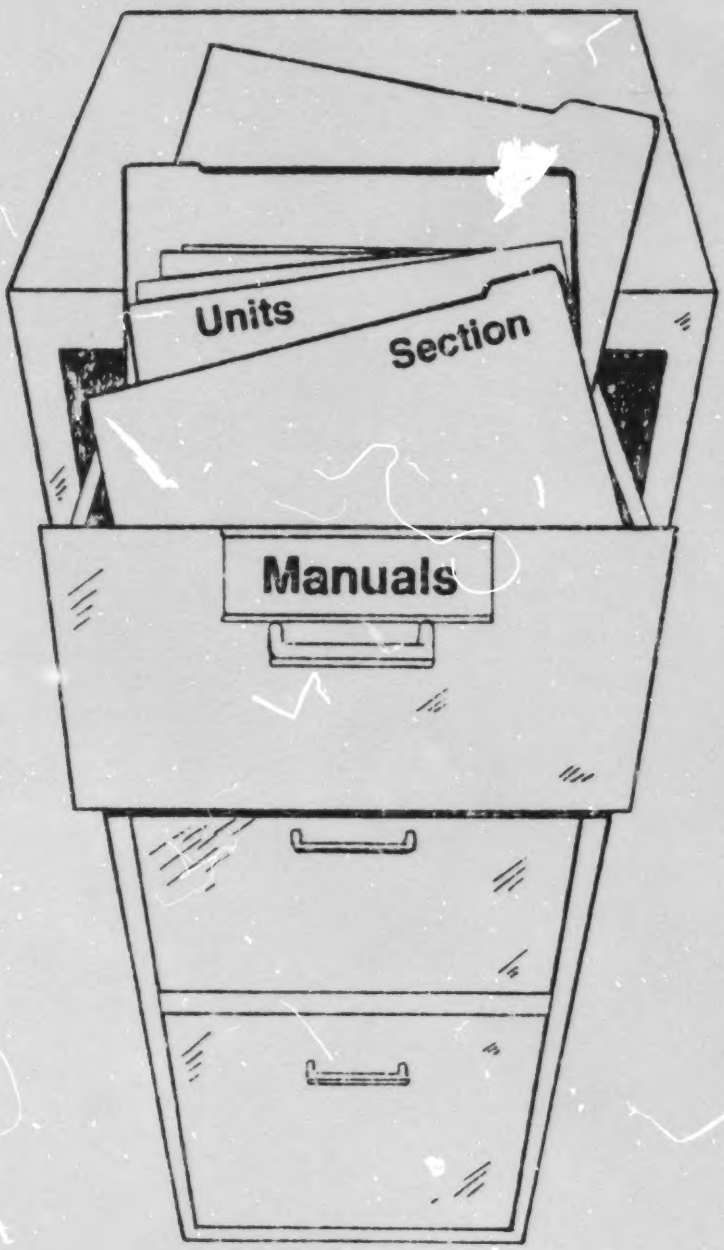
Application stage

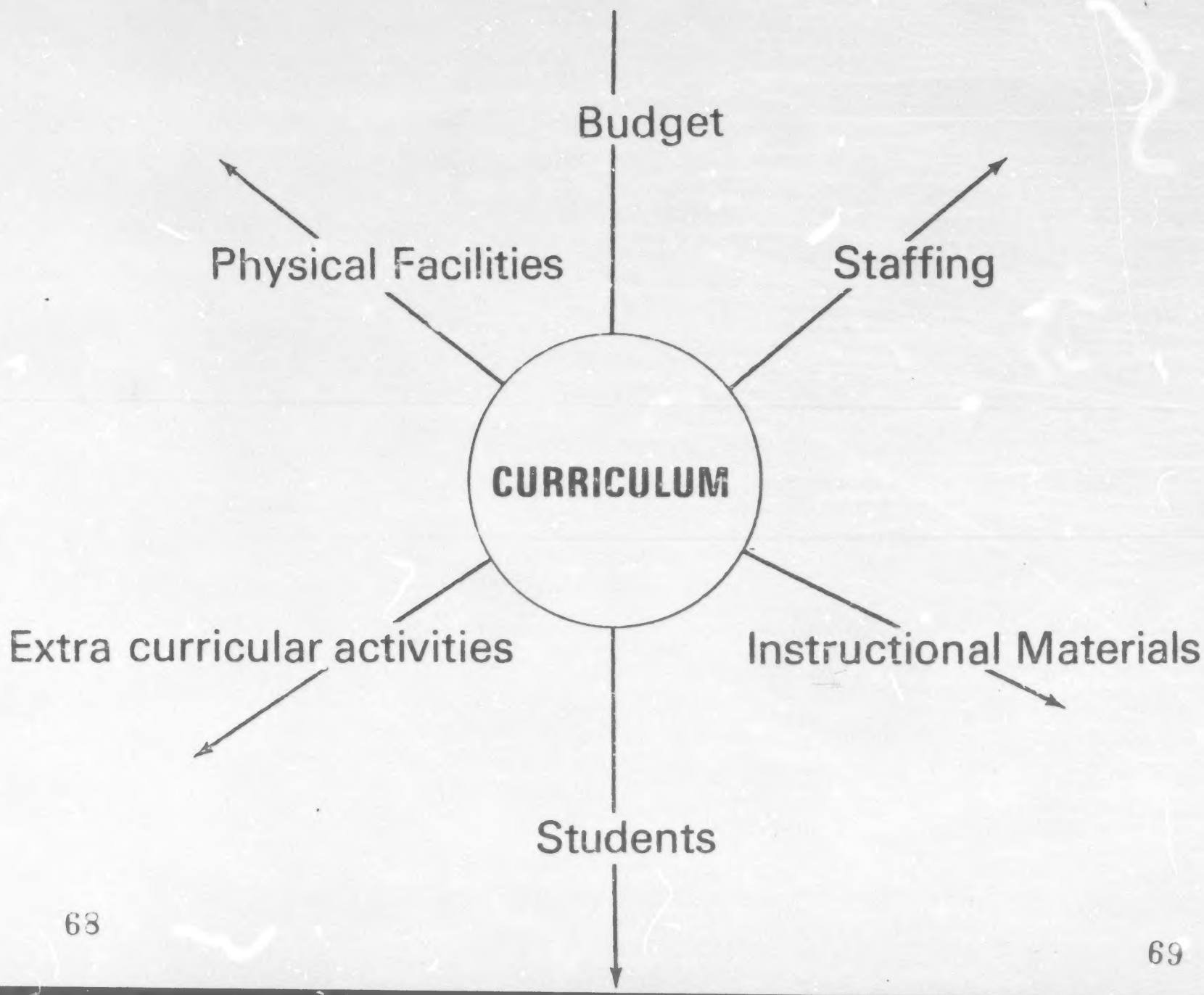
Evaluation stage

Binder Storage



STORAGE OF MATERIAL




Budget
Physical Facilities
Staffing
CURRICULUM
Extra curricular activities
Instructional Materials
Students

TEACHING UNITS OF INSTRUCTION

ASSIGNMENT SHEET #1-SELECT INSTRUCTIONAL METHODS

A variety of methods should be used in teaching a unit of instruction. The action verb in the specific objective can become a key to help determine teaching strategies and selection of instructional methods. It is important to select instructional methods for performance objectives that provide appropriate practice and prepare the student to reach the objective. Read each specific objective below and write in the space at the left instructional methods that would promote the teaching-learning process.

_____ 1. Match terms associated with blueprint reading and building codes to the correct definitions.

_____ 2. List functions of the nervous system.

_____ 3. Name the basic types of tires.

_____ 4. State the rule for calculating board feet.

_____ 5. Arrange in the usual order the steps of a sale.

_____ 6. Distingusish between hereditary and environmental influences on child development.

_____ 7. Discuss legal responsibilities of the Licensed Practical Nurse.

_____ 8. Identify types of concrete finishes for sidewalks and patios.

_____ 9. Select from a list the characteristics of a good ration.

_____ 10. Classify primary, secondary, and intermediate (tertiary) colors.

_____ 11. Construct an ad layout.

_____ 12. Demonstrate the ability to braze weld a square groove butt joint.

_____ 13. Describe the importance of an electric erasing machine.

_____ 14. Calculate cubic inch displacement.

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TEACHING UNITS OF INSTRUCTION

ASSIGNMENT SHEET #2--TEACH A UNIT OF INSTRUCTION

Select a unit of instruction from the instructional materials developed for your program area. Using the four stages for successful teaching-learning process, make your lesson plans for teaching the unit content and skills. Personalize/localize this unit to fit your teaching situation and style! After completion of planning, teach the unit of instruction. Some examples of things to include are listed below.

1. Determine motivational strategies, rationale for unit, presentation of objectives, instructional methods for all objectives

2. Mark the suggestions that you can use from the suggested activities page; be sure to write additional suggestions on this page

3. Write key words for lecture and discussion and additional examples (for localizing) on information sheet

4. Personalize and localize each assignment and/or job sheet for your teaching situation

   (NOTE: Consider physical facilities, equipment and tools available, and budget.)

5. Determine strategy for administering tests.

   Examples: Are you going to pretest? How are you going to use pretest results? Are you going to give tests in parts or as a whole?

6. Indicate approximate length of time needed to teach each objective

   Example: Day Two of Instruction--Teach objectives 5, 6, and 7

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TEACHING UNITS OF INSTRUCTION
UNIT II

ASSIGNMENT SHEET #3--MAKE A PLAN TO TEACH UNITS OF INSTRUCTION INCLUDED IN AN INSTRUCTIONAL MATERIALS MANUAL

Curriculum is a total educational process that involves the relationship of staffing, budget, facilities, students, extracurricular activities, and instructional materials. Use the attached fold-out chart to make a time plan in order to teach the units of instruction included within the instructional materials manual developed for your program area.

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UNIT OF INSTRUCTION

DEVELOPMENT

NAME _____

TEST

1. Match the terms on the right to the correct definitions.

_____a.	Statement of intended purpose (overall behavioral outcome) expected of each student after completion of a unit of instruction	1. Evaluation 2. Unit objective 3. Unit of instruction 4. Performance objective 5. Lesson plan 6. Taxonomy 7. Specific objective
_____b.	Plan of instruction for a single class period	
_____c.	System of classifying objectives into types or levels	
_____d.	Materials and/or information necessary for one or more class periods for the teaching-learning process in order to reach the unit objective	
_____e.	Statement of performance that instruction is to produce stated in terms of observable or measurable student performance	
_____f.	Statement of performance to be achieved in order for the student to be able to reach the unit objective	
_____g.	Means or process used to assess the student's achievement of performance objectives	

2. Explain the concept used in the development of units of instruction.

3. Arrange in order the following steps used in the process of developing units of instruction by placing the correct sequence number in the appropriate blank.

____ a. Provide in-service instruction about the use of the curriculum materials

____ b. Complete course outline

____ c. Gain input from curriculum committee

____ d. Determine need

____ e. Identify units of instruction to be written

____ f. Research and compile information needed to write a unit of instruction

____ g. Rewrite units

____ h. Print teacher and student materials

____ i. Disseminate completed curriculum to teachers and related persons

____ j. Obtain or complete task analysis

____ k. Edit units

____ l. Validate units by obtaining input from curriculum committee

____ m. Write units

____ n. Type units

4. Name three basic components of a performance objective.

a.

b.

c.

5. Select three components of a performance stated objective from the objectives given below.

a. After completion of the unit, the student should be able to list the five sources of consumer information. This knowledge will be evidenced by scoring eighty-five percent on the unit test.

1)

2)

3)

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b. After completion of this unit, the student should be able to identify the parts of a four-cycle engine and demonstrate the ability to disassemble and reassemble a gasoline engine. This knowledge will be evidenced through demonstration and by scoring eighty-five percent on the unit test.

1)

2)

3)

6. Arrange in order the nine basic performance terms by placing the correct sequence number in the appropriate blank.

_____a. Order

_____b. Apply a rule

_____c. Demonstrate

_____d. Identify

_____e. Name

_____f. Construct

_____g. State a rule

_____h. Distinguish

_____i. Describe

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9. Demonstrate the ability to:

   a. Distinguish between a performance stated objective and a nonperformance stated objective.

   b. Write specific objectives using the nine performance terms.

   c. Write a unit objective.

   d. Write specific objectives.

   e. Develop an information sheet.

   f. Design transparency masters.

   g. Develop an assignment sheet.

   h. Develop a job sheet.

   i. Write test questions to measure specific objectives

   j. Construct a test.

   k. Write answers to test.

   l. Plan suggested activities.

   m. Evaluate a unit of instruction.

   (NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

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UNIT OF INSTRUCTION

DEVELOPMENT

ANSWERS TO TEST

1. a. 2
   b. 5
   c. 6
   d. 3
   e. 4
   f. 7
   g. 1

2. Explanation should include:
   a. Encompasses many methods of curriculum development
   b. Focused on the student
   c. Based on competencies needed for employment
   d. Provides both teacher and student materials
   e. Provides scheme for evaluation through criterion referenced tests

3. a. 14
   b. 4
   c. 3
   d. 1
   e. 5
   f. 6
   g. 11
   h. 12
   i. 13
   j. 2
   k. 9
   l. 10
   m. 7
   n. 8

4. a. Exhibitor of performance--Who
   b. Observable performance--What (action verb)
   c. Acceptable responses--How much

5. a. 1) Student
      2) List
      3) Eighty-five percent

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b. 1) Student

2) Identify and disassemble and reassemble

3) Demonstration and eighty-five percent

6 a. 7 f. 5

b. 4 g. 3

c. 9 h. 6

d. 2 i. 5

e. 1

7 a. 6 e. 1

b. 3 f. 2

c. 3 g. 4

d. 1 h. 5

9 Any five of the following:

a. All resources are directed toward a measurable goal

b. Programs become uniform

c. Instructional materials are more easily managed

d. Teacher is able to fill a broader role

e. Standards are established for programs and employment

f. Programs become accountable

g. Individual needs of students are more easily identified

h. Opportunity is provided for in-service instruction on technical content

i. Teachers are assisted with program instruction

j. Students can be more highly motivated

k. Evaluated to the satisfaction of the instructor

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UNIT III

ASSIGNMENT SHEET #1 - COMPUTER HARDWARE

With a user's manual and a computer, locate and discuss the pertinent parts of the computer. Make sure you understand the function of switches.

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UNIT III

ASSIGNMENT SHEET #2 - OPERATING YOUR COMPUTER

Load your computer with your author software and become familiar with its menu. The idea is to load some program into the computer and make it function.

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UNIT III

ASSIGNMENT SHEET #3 - PROJECT DESIGN

Use your own idea or the forms included in Information Sheet Item V and design your project. Be sure to note where the computer is to be used and where support material is to be used.

GRAPHICS

UNIT IV

Objective

After completing this unit, the participant should be able to determine what kind of computer graphics would be suitable for their vocational student and design graphics incorporating graphic guidelines. The student should also be able to utilize a CAD system and manuals to draw graphics. This knowledge will be shown by completing graphics on a computer for student use.

Specific Objectives

After completing this unit, the participant should be able to:

1. Determine when to use graphics in a project.
2. Discuss ways of designing graphics.
3. Name attributes of good graphics.
4. Name the parts and functions of commands of a CAD system.
5. Demonstrate the ability to:
   a. select good graphics.
   b. draw graphics for a project.

GRAPHICS

UNIT IV

INFORMATION SHEET

It's true that a picture is worth a thousand words, especially if you have spent a lot of time on your picture. That is, it is well thought out and not cluttered.

Imagine for yourself how easy it is to recall a graphic image from your memory instead of many terms and their definitions. If you plan to use only graphics in your project that's fine. And if you plan to use text and questions with your graphics that's best.

The following two units will cover text and interactions. Remember, it is alright to do your graphics now and add text later and interactions even later yet.

I. Guidelines

A. Graphics uses "space".

1. "Space" or computer memory has been expensive but is getting cheaper.

2. The more memory your computer has the longer your project can be.

3. Software packages usually have an indication as to how much memory is left after a "drawn" graphic has been put (saved) in memory.

B. If space is a concern, keep your graphics simple and consider using the same graphic over and over (i.e. refer back to it).

C. Graphics Use.

1. Use as a focal point around which all text material is presented.

INFORMATION SHEET

EXAMPLE:

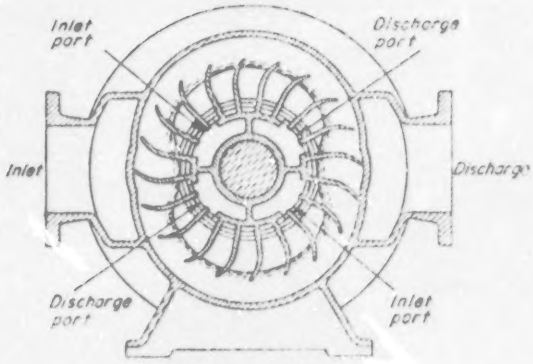
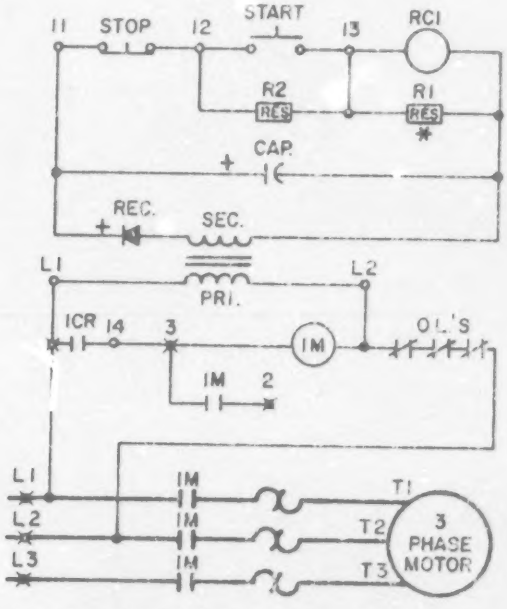


Diagram illustrating the operating principle of a rotary liquid piston type compressor or vacuum pump.

2. Use when a large amount of material can be covered with one simple picture.

EXAMPLE:



* INDICATES TERMINALS ON MAGNETIC STARTER.
* TO INCREASE TIME DELAY REMOVE RESISTOR RI.
o INDICATES TERMINALS ON TIME-DELAY, LOW-VOLTAGE RELEASE.

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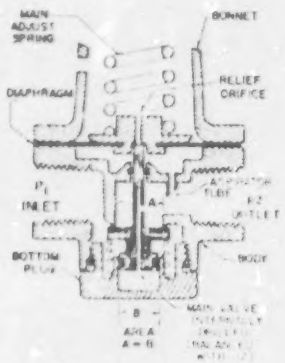
INFORMATION SHEET

3. Use when visual perception is the quickest way.

EXAMPLE:



II. Drawing Graphics

A. Tracing

If your computer has a "mouse" and tablet or perhaps a touch screen you can "draw" directly on the tablet or screen by laying a sketch of your graphic on the tablet or screen and tracing it. This is easiest.

B. Sketching

Use the resident draftsman or artist to "draw" directly on the tablet or screen. After they have created your picture your software will allow you to delete parts or expand parts as you need. But, remember to first "save" the original before you begin your deletions.

C. Addition of Color

Color is very helpful in a graphic but stay away from color coding. Every monitor has different shades of color.

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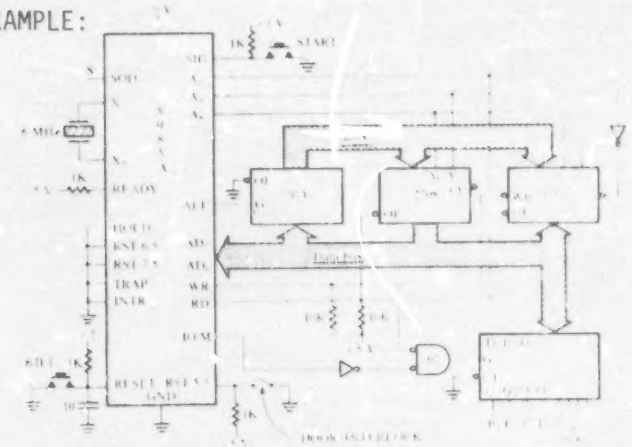
INFORMATION SHEET

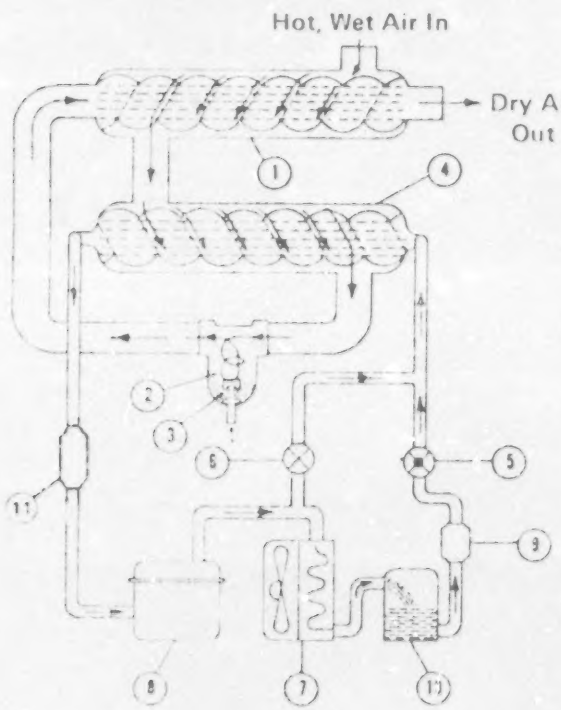
D. Your graphic should depict something.

EXAMPLE:



E. Include brief directional guides.

EXAMPLE:



1. Air to Air Heat Exchanger
2. Separator
3. Automatic Drain
4. Air to Refrigerant Heat Exchanger
5. Refrigerant Metering Device
6. Bypass Valve
7. Condenser
8. Refrigerant Compressor
9. Refrigerant Filter Dryer
10. Receiver
11. Suction Line Filter

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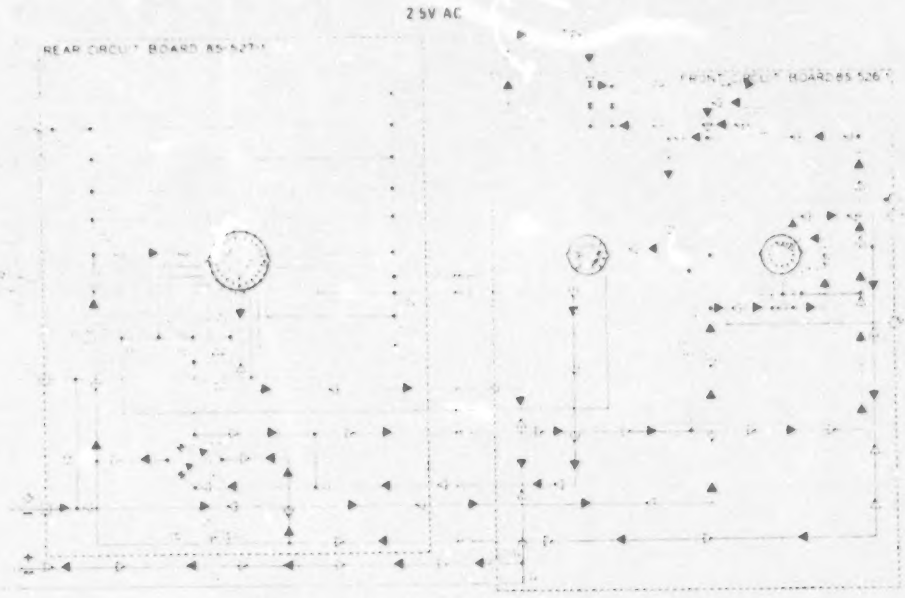
INFORMATION SHEET

F. Graphic correlates to lesson.

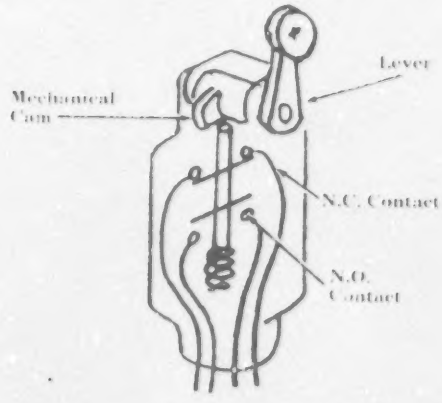
EXAMPLE:



(NOTE: This graphic covers too much material.)

G. Fit your graphic to the level of student.

(NOTE: Involved graphics scare off beginners and too simple graphics would bore more advanced students.)



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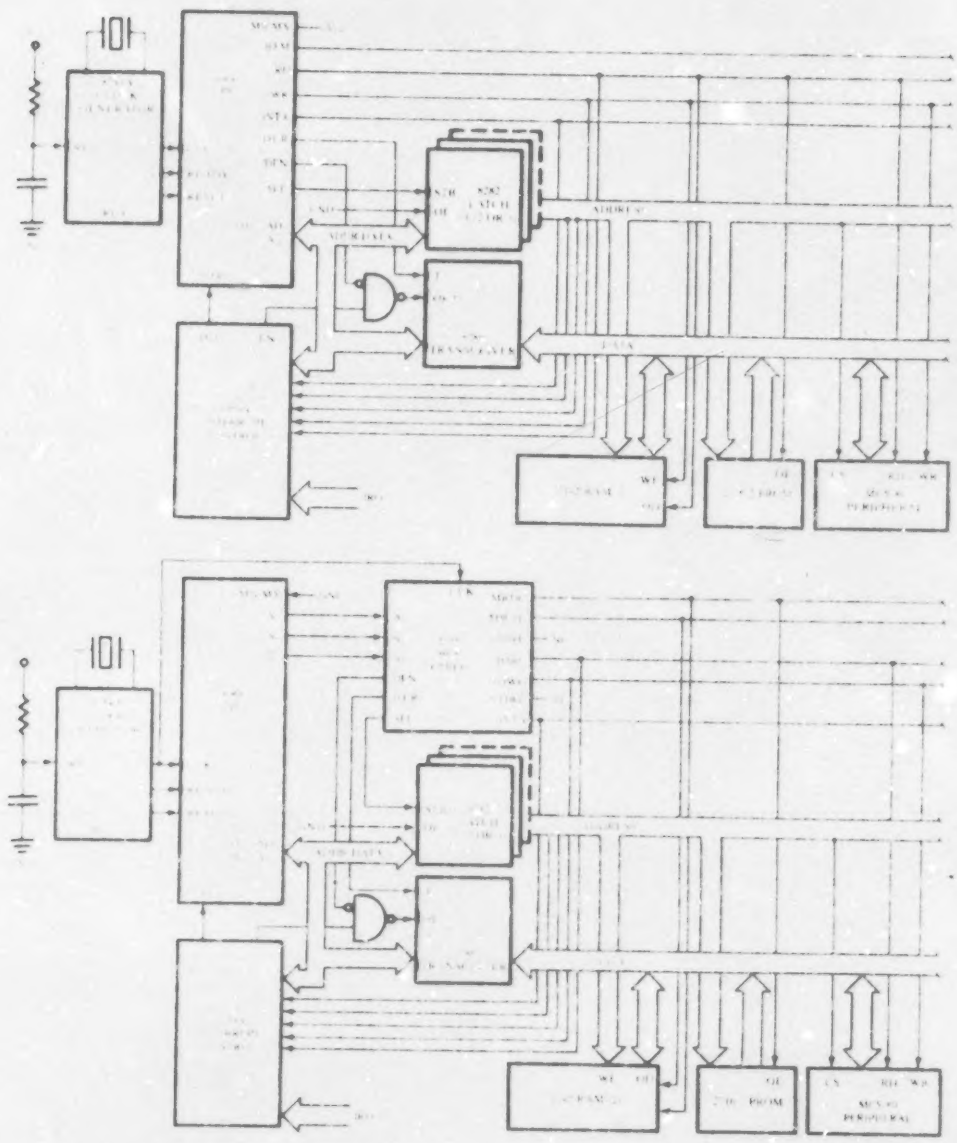
Information Sheet

H. Divide involved graphics

(NOTE: The total picture could be shown after smaller parts are digested.)

EXAMPLE:



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INFORMATION SHEET

I. Moving Graphics

If your software has "motion" capability, animation is useful if the movement doesn't distract from instruction.

INFORMATION SHEET

III. Drafting Graphics

Some will have computer systems that have drafting/ drawing software.

(NOTE: This is an attempt to explain, generally, what you might expect with a CAD system (computer aided drafting or drawing.)

A. Equipment

1. light pen - allows operator to write directly on the monitor screen and into the computer.

2. mouse - allows operator to write on a tablet attached to a computer.

3. joystick - allows operator to move cursor (symbol) around the monitor screen.

4. keyboard control - allows operator to use keyboard to move cursor around the monitor screen.

5. tablet - flat plate attached to a computer to represent drawing paper.

6. monitor screen - the CRT (TV screen) of a computer that represents drawing paper.

7. menu - a list of your computer's options presented on your monitor.

8. options - circle, line, arc, spline, scale, etc.

9. software - contains the commands that control the drafting.

10. printer - plots the drawing and text that has been constructed on the monitor much like a blue print machine.

INFORMATION SHEET

B. Drawing

Most drawings can be accomplished with just a few different "parts." (The following are general instructions you will find in a CAD system.)

1. Point

   a. use menu to select "print".

   b. place light pen or mouse at proper place. (example only).

   c. give draw command.

2. Line

   a. use menu to select "line".

   b. use light pen or mouse to make end points.

   c. give draw command.

3. Circle (ellipses, arcs, parts of circles)

   a. use menu to select "circle".

   b. different methods

      1. select point and radius.

      2. select two tangent lines.

      3. select three points on a circle.

      4. select diameter and point on the circle.

      5. to draw arc draw circle delete parts you don't want.

   c. give draw command.

INFORMATION SHEET

4. Other commands

   a. rubber band lines -

      1. place pen on screen for first point

      2. move pen on screen to second point,

      3. line follows pen.

      4. give draw command to fix line.

   b. rectangle (box)

      1. place two points on screen.

      2. rectangle will be drawn using the points as the endpoints of the diagonal

   c. crosshatch and fills

      crosshatching or shading will fill the enclosed area surrounding pen placement.

   d. fillet - rounding selected corner of drawings.

   e. rotating - drawing will be rotated a certain amount determined by an angle.

   f. layering - successive graphics representing, for example, successive layers of a structure.

   g. nesting - inserting figures into other figures.

   h. scale - ability to change size of a picture instantly.

   i. editing - ability to erase or move lines.

INFORMATION SHEET

(NOTE: The author has found that different systems have many common terms of which these are just a few. It is my observation that with an operating manual and a few demonstrations you can utilize a CAD system as a computer in your project. (A computer is a computer)!)

UNIT IV

ASSIGNMENT SHEET #1 - GOOD GRAPHICS

Use item II of this unit and magazines to select examples of good graphics. Sketch your own if you have the skill.
(NOTE: These graphics can be those to be used in your project.)

UNIT IV

ASSIGNMENT SHEET #2 - DRAWING PROJECT GRAPHICS

Use your software and computer to sketch, trace or draw the graphics for your project. Use the "save" function of your computer to save the graphic!.

TEXT

UNIT V

OBJECTIVE

After completing this unit the participant should be able to select appropriate methods of presenting text materials on a computer to specific vocational students and write text utilizing these methods and guidelines. This knowledge will be shown by completing text material on a computer for their students.

SPECIAL OBJECTIVES

After completing this unit the participant should be able to:

1. Select different methods for emphasizing text materials.
2. Discuss ways to avoid poor text.
3. Demonstrate the ability to write text for his/her project.

TEXT

UNIT V

INFORMATION SHEET

This unit was written to help you integrate text into your project. All microcomputers weren't created the same when it comes to functions that they can perform. Some computers weren't designed to do things that others do. Therefore, you will have to study your software and hardware manual to find which functions your equipment will perform.

It is hoped that these sections will add to what you find in your owners manual. For example, if you can't find symbols or characters you want you can use an artist to draw the symbol, or characters of your own design. He can "generate" them and you can "save" them on your computer for later use.

Use your owners manual when you can for the "tricks and techniques" and use the following as a supplement.

I. Text Methods

Presenting an attractive screen that has just the right amount of text in the right places is an art form. The usefulness of your project will be directly related to the amount of effort you spend in preparing each display or screen. In addition to what you find in your owners manual, the following ideas are included to help make your screens more than just words.

A. Screen Size

This is probably the easiest thing to find in your owner's manual. You will need to know how many spaces across and lines down the screen there are. In addition, your manual should tell you how amny positions horizontally and vertically are not used because a screen may not be adjusted properly and will cut them off.

EXAMPLE:

ow is the time for all good men to come t
he aid of their country.

B. Underlining

When making a special point you can underline the important parts for emphasis. Underlining becomes ineffective if used to often.

EXAMPLE:

Turn off the electricity before connecting the circuit.

C. Boxing

This method is good to highlight a comment. A student has a better chance of not missing information in a box. Two comments can be in the box and set apart by using different sized letters.

EXAMPLE:

```
++++++++++++++++++++++++++++++
+          TEST IV           +
+                            +
+          PIPING            +
++++++++++++++++++++++++++++++
```

D. Lettersize

Different vocational groups might appreciate different sizes and shapes of letters. Try different sizes and shapes to find which appeals to your students.

If your computer doesn't have what you want, use your local artist or draftsman to paint a set that you like. Save the set in the computer memory and bring it up when you need it.

(NOTE: The "Macintosh" Computer by Apple has "infinite" varieties of letters and characters.)

E. Inverse

Instead of using a white screen with black letters, the inverse may be used for emphasis. (i.e. black screen with white letters.) A little of this goes a long way.

F. Flashing

Draw attention to an important point by flashing letters or an underline. This gets old quick.

(NOTE: If the student doesn't catch a point after a period of time, flashing the pertinent information may help.)

INFORMATION SHEET

G. Text Speed Change

If the speed of text presentation is too slow students could become bored, but a change is good for variety. You can come back later to vary speed.

(NOTE: You might slow down for important material.)

H. White Space

A good general rule is to use a lot of white space. Spread out your text both vertically and horizontally.

II. Text Tips

The following ideas are listed to help you in your text design.

A. Variety

Sometimes students won't know the screen has changed because there is no difference in the style of presentation. To prevent this make every screen different by using different spacing and centering.

B. Text Placement

Text can be in different places on the screen for emphasis normally it should be centered, spaced, uncrowded and always before and separated from questions.

EXAMPLE:

The two-value capacitor motor combines the quiet operation and the limited speed control of the permanent-split capacitor motor with the high starting torque of the capacitor-start motor. Where quiet running performance is not particularly important, the less expensive capacitor-start motor is generally selected.

The primary advantages of the two-value capacitor motor are its _____ starting torque,_____operation and the possibility of_____ control.

INFORMATION SHEET

C. Grammar

Try to prevent dividing words when going from one line to another. If your grammar is weak ask someone to proof read your product.

D. Sentence Breaks

Since some screens are small you'll find yourself splitting sentences. Try to make the break at natural pauses. Or make a break for emphasis.

EXAMPLE: Groups of atoms that act as tiny magnets are restricted by their molecular structure.

Groups of atoms
that act as tiny magnets
are restricted
by their molecular structure

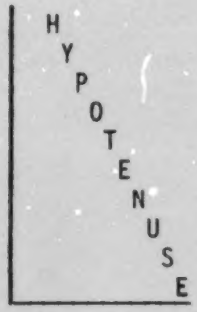
E. Text Size

The level of the student should be always considered when filling a screen with text. Use trial and error to see what size works best for your students.

F. Visual Text

Using text as a graphic is a good idea if the idea is not carried too far (too involved). Uisng text vertically or diagonally are good examples.

EXAMPLE:



INFORMATION SHEET

G. Text images for Remembering Concepts

Students remember images more easily than ordinary text. This also can be overdone if used to often.

H. Learner Control

A most effective way of learning good material is for students to learn at their own pace. Therefore, let the student control screen changing by pressing the space bar, up arrow, or whatever your computer uses to control screen changes.

I. Scrolling

Text moving up and off the screen is called scrolling. The student should be in control of the screen and automatic scrolling should be avoided.

For example, a student reads new material then answers a question incorrectly. If scrolling is used, the material is gone. The better method would be to keep the material, question and answer on the same screen.

If that's not possible at least give the student the means to control returning to a previous screen to review the material.

J. Just to remind you, concepts should be in sequence and care should be taken to not overload a screen with too many concepts. Go to a new screen rather than splitting up a concept.

EXAMPLE: Crowded screens make for crowded learning.

K. Reading level

It is a good idea to continously check the reading level either by having students review it or by having your peers review it.

Recall, students should have an opportunity to learn new terms and definitions before they are used in text.

STUDENT/INSTRUCTOR INTERACTION

UNIT VI

OBJECTIVE

After completing this unit the participant should be able to choose appropriate computer interactions to use with specific vocational students. This knowledge will be shown by completing questions on a computer for student use.

SPECIAL OBJECTIVES

After completing this unit the participant should be able to:

1. Determine which kinds of questions he/she is going to use in their project.
2. Discuss ways to avoid poor computer questions.
3. Demonstrate the ability to write questions for a project.

STUDENT/INSTRUCTOR INTERACTION

UNIT VI

INFORMATION SHEET

After students have been exposed to material the instructor needs to find whether the student has absorbed the material. This unit covers student/instructor interactions or questions using a computer.

I. Kinds of Questions

You probably are an experienced educator that knows how to measure your students' knowledge, but you will find that you need to adjust your thinking to coincide with the capability of a computer. In addition to what you find in your instruction material, included below are more ideas on questions.

A. Multiple choice

1. Listing answers in a column is easy for the student and computer.

2. You can use A,B,C, etc., but number (1,2,3, etc.) for answers are easier since most computers have number pads separate from the keyboard.

3. Another way to select a right answer is to move the cursor to the correct number on the screen.

4. Some computers have touch screens so that you can touch the right answer on the screen.

5. One other method is to have an automatic moving cursor that is stopped at the correct answer as the cursor passes it.

B. Form

1. Here a form is displayed on the screen that has a series of related questions.

2. This method is probably the best "real world" model.

INFORMATION SHEET

EXAMPLE: Form to fill in heat load.

C. Complete the sentence

1. Normally completing the sentence is a good method but only if the student answers with the exact computer answer. One way to get around this problem is to allow the computer to "look" for as many answers as you give the computer. Otherwise the student gets incorrect response to misspelled words.

2. Good for presenting a visual response to the student.

   EXAMPLE: Complete the sentence with several right answers. The first president of the United States was _____.

   Computer looks for: Washington; G. Washington; or George Washington.

D. Word Responses

1. The same problem as in item C. The student will get a correct score only if he spells his response exactly like the computer response.

   EXAMPLE: Presidential terms are how long?
   Computer rejects: 4, cuatro, four. Computer accepts only: FOUR

2. Students could develop the correct answer set for the computer.

3. If you want multiword response (essay) you could go ahead and save the students' responses with out grading them. Later, you can go back and grade the "essay" type responses. Students should be able to look at their grades and your grading which most "authoring" software allows.

INFORMATION SHEET

E. Multiple Answers

1. Normally there would be nothing wrong with this, but with a computer you have to allow for both answers to be in one or the other space.

2. You could break the question into two questions.

3. It is good practice to have one question per screen line.

4. Again you will have to make allowances for multiple spelling.

5. It is also good practice to have the answer begin on the same line as the question mark.

Which day is the third day
of the week? Tuesday

F. Yes/No

1. It is advised that you not use: 1 = Yes and 0 = No.

2. Normal practice here is to look for the first letter only (Y or N).

3. Remember a student might guess on yes/no and true/false questions.

II. Questioning Tips

A. Reading Level

1. Be sure your question and answer are at your student's level.

INFORMATION SHEET

2. Should your answers require correct spelling? If you don't think so, you may give the computer many mispelled words to accept as the correct answer.

3. Students may not understand your symbols so be careful of the characters you use.

B. Long Responses

1. You may find that you are testing for typing ability if you request long responses.

2. Limit typing to one word if at all.

3. Have students choose from a list (1, 2, or 3).

4. Touch screen from a list would be best.

C. Screen Options

1. When a student must make a choice, his options should be listed on the screen.

2. If that isn't possible the student should be able to "back up" to the information screens.

3. Some computers allow students to type in HELP for return to information screens.

4. List the answers that a student has the option to pick. This allows the student to evaluate the options and choose the best one.

D. Tests Specific Objective

To make sure the student knows what he is to learn, questions should be referenced directly back to specific objectives. This way the student knows what he has to learn. (Criterion referenced measures.)

E. Questions Referenced to Information.

1. The student should easily recognize questions and relate the question to information recently covered.

INFORMATION SHEET

2. If you feel there is a chance of the student misunderstanding, an example may help.

3. Or perhaps a clue instead of an example.

F. Placement on Screen

1. Place questions on the screen so that answers can be given or at least started on the same line.

2. Leave space for answers.

3. Look for short responses.

G. Incomplete sentences and abbreviations

1. Without the teacher an imcomplete question becomes an unsolveable problem. Use complete sentences.

2. Abbreviation also adds to a student's frustration. Abbreviation should also be avoided as todays computers usually have large memories.

STUDENT INPUT/COMPUTER REACTION AND PROJECT EVALUATION

UNIT VII

OBJECTIVE

After completing this unit the participant should be able to design and write appropriate student input for computer questions and design and write positive reinforcing feedback to student input. The participant should be able to evaluate a computer graphices project. This knowledge will be shown by completion of student input and computer reactions for vocational students and evaluation of a computer graphices project.

SPECIFIC OBJECTIVES

After completing this unit the participant should be able to:

1. Discuss different ways of inputing answers.
2. Discuss ways of improving answer input.
3. Design feedback to student responses.
4. Evaluate a project.
5. Demonstrate the ability to
   a. Write student input and computer reactions.
   b. Evaluate a computer graphices project.

STUDENT INPUT/COMPUTER REACTION

UNIT VII

INFORMATION SHEET

Computer systems are notorious for their frustrating error messages. These are messages an operator receives via the screen when something has been "put" in the computer wrong. By now you are probably quite aware of this.

This unit has been included to help you set up your student's input to prevent their entering system errors in addition to answers to questions and problems. Examples will be given on kinds of input you should allow and tips for formatting student input. In addition, the subject of feedback will be covered. Again, this unit is optional and can be added and/or changed at a later time.

INFORMATION SHEET

I Kinds of Input

Good simple input may require more computer memory but will result in the student moving along smoothly.

A. One Character

1. Easiest and can be even easier if you limit the student to numbers.

2. Consider using one character and the space bar. This allows the student to change his entry before pressing the space bar to enter the character into the computer.

3. Whichever you choose, consider not mixing space bar with nospace bar input.

B. Matching

1. The student's answer is matched character for character and counted wrong if there is a mismatch.

2. Could assure an average "right" match by testing the project with student's input to obtain a common answer.

INFORMATION SHEET

C. Match Search

1. This is a search for a specific word in a group of words.

2. Computer wise this uses more memory and more programming.

EXAMPLE: What city is the capital of Arizona?
Phoenix is the capital.

(NOTE: This answer would be correct as the computer would be looking for the sequence: Phoenix.)

3. To avoid this situation use multiple choice answers and select from a list.

4. If open response is what is desired you will need to include all possible alternative answers. Computers are limited in input processing when compared to teachers because of memory storage.

D. Timed

1. There are situations when timing the input adds somethings to the lesson students are learning.

2. Useful for recalling basic facts such as math or terminology.

II. Input Tips

A. Allowing Misses

1. It is smoetimes encouraging and not so threatening to allow students at most three tries to get the answer correct.

2. Students are probably wrong if they miss more than twice.

3. Missing provides a learning situation.

B. Alternate Responses

1. You should be prepared for many answers to a yes question. (Yup = Yes =Yep)

2. The usual yes/no answer is too ask for "y" or "n" and forget the rest of the word.

INFORMATION SHEET

3. Remember, there are more than two answers to yes/no questions. (Yes, no, (blank), (something else), (Upper/lower case).

EXAMPLE:

Answer: (blank), (something else)

Response: This question must be answered with a yes or no.

4. What do you plan to do with an answer that is too long or too short? Print a response saying that and "try again".

5. It is also a good idea to have students press the space bar (or some other key) after they have entered their answer. This would allow students to an oppurtunity. to correct their response befor entering their answer into the computer for grading.

C. Help

1. Have students type HELP for additional information. "Help" would be an answer to a question. The computer would not count the response wrong but instead would send students to additional information, back to the original information or to a menu where students could choose where they wanted to go. This is an excellent option for a project to have but as you can imagine requires effort, both, by the computer and the instructor.

D. Escape

1. There will always be on occasion when students need to stop in the middle of a lesson and return later to resume where they left off. Most software have the ESCAPE option.

2. If there is not an ESCAPE option you could add ESCAPE to one of the right answers and send the student to the menu or beginning of the lesson. When the student resumes he will step down to the point he left. A bad point here is that a student might want to go back and rework all the problems for a better grade (Good projects have a high price!) One way around this is to have a lock on each question that has been graded. This way students could be sent to the first ungraded question.

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III. Feedback

Feedback can be made of graphics, responses or a combination of both. The more feedback a project has the more "elegant" it will become. Feedback can be used to direct students into correct thinking or to reinforce student thinking.

A. Screen Placement

Feedback should be placed immediately by the answer.

B. Reinforcement

1. Feedback should be positive and encourage students to go on either to the right answer or the next problem.

2. You might have your feedback be a reward.
   EXAMPLE:
   a. Play a short tune
   b. Announce a good score
   c. Show a jelly bean graphic.

3. Downplay reinforecment for wrong answers.

4. Try to avoid breaking the timing of the lesson with a long reinforcement.

C. Messages

1. The response should not detract from the lesson.

2. Avoid responses that will become outdated.

3. Responses should only help students learning.

D. Print the Correct Answer

1. The correct answer could be placed in a fill-in-the blank question to reinforce learning.

2. The correct answer could be automatically underlined or turned into a flashing response.

E. Variety

1. It takes more memory storage to have many different feedback responses but, if you don't, students won't pay attention after the same "Good Work!" comment.

2. Have as much variety as you can afford.

INFORMATION SHEET

3. Make the response material related.

F. Clues

1. When students give an incorrect answer give them a response that contains material necessary to answer all the question and let them try again.

2. You could give students an alternate question that covers the same material.

3. A more difficult idea would be to use the wrong answer to build a clue on. (More human!)

EXAMPLE:

Question: The main forms of energy are _____ _____ _____.

1. Answer: Heat
   Response: There are more. What about energy due to position or motion?

2. Answer: Heat, Potential
   Response: There are more. What about energy due to motion?

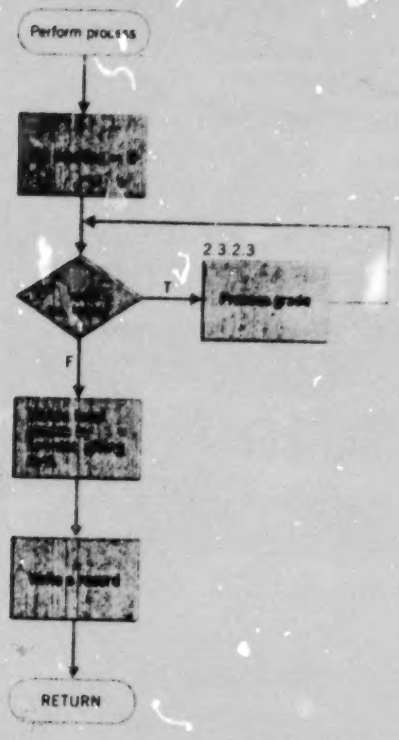
3. Answer: Heat, Potential, Kinetic
   Response: Correct, These are the three main forms of energy.

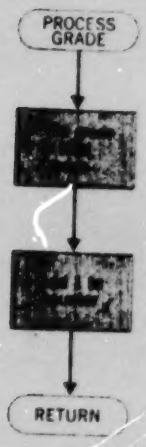
G. Branching

1. If students choose the wrong answer the instructor has the option of sending students back to redo the lesson or review some related material then redo the question.

2. If the students gets the answer right they are branched forward to the next question.

EXAMPLE





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INFORMATION SHEET

H. Reading Level

1. The reading level should be checked either by students or peers.

2. One idea is to make the reading level of the wrong answer response a little higher than to which students are accustomed.

I. Redo Wrong Answers.

1. If students know that as soon as they complete a lesson they will have to redo all the questions they missed, students will be more motivated to learn the right answer when they first miss the question.

2. Present students a different question over the material they first missed.

IV Project Evaluating

Now that you have designed your project it is time for you or preferably, your partner to evaluate content of your project.

A. Preliminary check list.
1. Which learning method is being used?
2. Is the use of the computer good for the group to be taught?
3. Does the project fit into the curriculum easily?
4. Do the tasks build upon each other?
5. Is there readable documentation?

B. Design checklist (assume the CIMC form has been used)
1. Have the specific objectives been stated at the beginning?
2. Are the Information, Assignment, and Job sheets, and test directly correleated to the specific objectives?
3. Do the sheets in item two show the relationship to the computer presentation?
4. Does the project get and hold student interest?
5. Are the specific objectives shown to students?
6. Have prerequisite skills been accounted for?
7. Depending on the learning method, has presentation of new material followed item six?
8. Have examples or encouragement been included to guide students after presentation of new material?
10. After student interaction is there proper positive feedback?
11. Are students properly tested so that they feel they have mastered the new material?
12. Have means been included to insure new material retention?

UNIT VII

ASSIGNMENT SHEET #1 - STUDENT INPUT
AND COMPUTER REACUTION

Using software and hardware manuals write student input and computer reactions to project questions.

UNIT VII

ASSIGNMENT SHEET #2 - PROJECT EVALVATION

Using the guidelines given in this unit item IV evaluate a project.